

Linked

INNOVATIVE CHAIN MAIL JEWELRY DESIGNS

Compiled by
Karin Van Voorhees



Featuring
John Fetvedt
Diane Miller
Anne Mitchell
Laura Poplin
Sue Ripsch
Vanessa Walilko

Linked

INNOVATIVE CHAIN MAIL JEWELRY DESIGNS

Featuring

John Fetvedt

Diane Miller

Anne Mitchell

Laura Poplin

Sue Ripsch

Vanessa Walilko

Compiled by

Karin Van Voorhees



Kalmbach Books

21027 Crossroads Circle
Waukesha, Wisconsin 53186
www.Kalmbach.com/Books

© 2014 Kalmbach Books

All rights reserved. Except for brief excerpts for review, this book may not be reproduced in part or in whole by electronic means or otherwise without written permission of the publisher.

Lettered step-by-step photos pages 6–16 by Sue Ripsch, pages 25–26 by Diane Miller, page 29 by Kate Ferrant Richbourg, pages 37–38 by Anne Mitchell and Kate Ferrant Richbourg, page 41–45 by John Fetvedt, and pages 61–72 by Laura Poplin. All other photography © 2014 Kalmbach Books.

The jewelry designs in *Linked: Innovative Chain Mail Jewelry Designs* are the copyrighted property of the designer or publisher, and as such, they may not be taught or sold without permission. Please use them for your education and personal enjoyment only.

Published in 2014
18 17 16 15 14 1 2 3 4 5

Manufactured in China

ISBN: 978-1-62700-089-5
EISBN: 978-1-62700-080-2

The material in this book has appeared previously in *Bead&Button*, *Art Jewelry*, or *Wirework* magazines or *Unconventional Chain Mail Jewelry* or *Classic Chain Mail Jewelry* books. *Bead&Button*, *Art Jewelry*, and *Wirework* are registered as trademarks.

Editor: Karin Van Voorhees

Art Director: Carole Ross

Photographers: William Zuback and James Forbes

Publisher's Cataloging-in-Publication Data

Linked : innovative chain mail jewelry designs / compiled by
Karin Van Voorhees.

p. : col. ill. ; cm.

"Featuring John Fetvedt, Diane Miller, Anne Mitchell, Laura Poplin, Sue Ripsch, Vanessa Walilko."

"The material in this book has appeared previously in *Bead&Button*, *Art Jewelry*, or *Wirework* magazines or *Unconventional Chain Mail Jewelry* or *Classic Chain Mail Jewelry* books."—T.p. verso.

Issued also as an ebook.

ISBN: 978-1-62700-089-5

1. Chains (Jewelry)—Handbooks, manuals, etc. 2. Metal-work—Handbooks, manuals, etc. 3. Jewelry making—Handbooks, manuals, etc. I. Van Voorhees, Karin.

TT212 .L565 2014
745.594/2

contents

Introduction 4

Sue Ripsch

3-in-3 with a Twist chain	6
Celtic Line bracelet & earrings	8
Crazy Eight set	10
Monty Python bracelet.....	14

Diane Miller

Celtic Visions pendant	18
Vortex pendant & earrings	20
Queen's Link bracelet	22
GSG Chain Mail bracelet	24

Anne Mitchell

Double-Cross Link bracelet	28
Chain Mail Overlay bracelet	30
Beyond Chain necklace & bracelet	32
Ancient Links necklace	36

John Fetvedt

Half-Byzantine hoop earrings	40
Mixed-Metal Double-Barrel bracelet	43
Double-Cross Chain set.....	46
Graceful Chain earrings	48

Vanessa Walilko

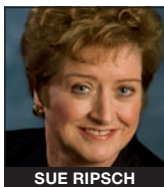
Art Deco necklace.....	52
Reversible Chain Reaction bracelet.....	56

Laura Poplin

Akemi earrings	60
Lille bracelet	63
Joie de Vivre pendant	66
Clichy pendant & earrings.....	69

Basics & More

Tools	74
Jump Ring Metals	76
Making and Using Jump Rings	78
Soldering	80
Standards and Practices in Chain Mail ...	81
Control the Fit	83
Finishing	86
Jewelry-Making Techniques	87



SUE RIPSCH



DIANE MILLER



ANNE MITCHELL



JOHN FETVEDT



VANESSA WALILKO



LAURA POPLIN

Ancient Art for Modern Times

Centuries ago, chain mail (or maille) armor was created by the Celtic people for solely practical purposes. Tightly linked metal rings provided unprecedented protection on the battlefield—a distinct advantage to those who wore it.

Linking tiny rings of gold, silver, or steel progressed from purely utilitarian purposes, and chain mail jewelry and other adornments became common. Chain mail weaves evolved from three distinct cultures: Japanese, known for using small rings in flat patterns such as the 12-in-2 or the Chrysanthemum; European, most commonly recognized for the 4-in-1 pattern and its variations; and Persian, distinguished by more decorative ornamentation.

Contemporary chain mail artists have not only reproduced ancient weaves, but they also have combined and blended patterns and materials into unique, modern jewelry art. Six such artists are featured in this collection: Sue Ripsch, Diane Miller, Anne Mitchell, John Fetvedt, Vanessa Walilko, and Laura Poplin. Each designer opens, links, and closes jump rings with the same motions, but the resulting jewelry couldn't be more different. Whether it's gleaming sterling silver chain that flows along the wrist, bold and colorful combinations of anodized niobium links, or patterned chain blended with organic leather or sparkling crystal, you are sure to find projects in this collection that challenge your creativity and boost your understanding of this remarkable art.

Before you begin, you may want to review the Basics section beginning on page 73. You'll find a thorough explanation of tools used in chain mail, an overview of different metals and how they fare in jump ring and chain mail construction, and comprehensive directions for making your own jump rings. Additionally, basic instructions for soldering, finishing, and jewelry-making techniques are included. Finally, experts Vanessa Walilko and Anne Mitchell provide excellent commentary on chain mail standards and practices, and on using aspect ratio to control the fit of a piece.

Sue Ripsch

“Chain mail allows creative expression and results in fine, handmade jewelry.”

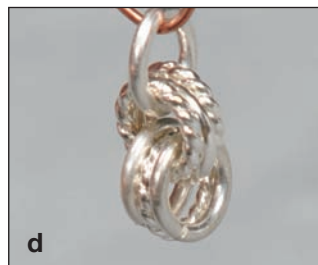
A registered nurse by profession, Sue has always enjoyed handcrafts. When she took a class to learn Byzantine weave, she became hooked on chain mail. She worked from whatever scarce patterns she could find and soon began developing her own designs. As she began to teach others, she realized that she wanted to share her knowledge and instructions with as many people as she could by writing books. She is honored to join you in your creative pursuits and hopes she adds a small amount of joy to your life.



3-in-3 with a Twist chain & earrings

Simple but elegant, the twisted rings in this set give off a beautiful radiance and shine that draws the eye to your wrist or ears. The bracelet is substantial but lies nicely along your wrist and is quite comfortable to wear.





materials

bracelet, 7 in. (18cm)

- Sterling silver jump rings
 - 70 16-gauge 5.0mm ID, 10 rings per in. (4 rings per cm)
 - 70 16-gauge 5.0mm ID twisted, 10 rings per in. (4 rings per cm)
 - 2 16-gauge 5.0mm ID
- Clasp

earrings

- Sterling silver jump rings
 - 14 16-gauge 5.0mm ID
 - 12 16-gauge 5.0mm ID twisted
- Pair of earring wires

tools

- Chainnose pliers
- Flatnose pliers
- Wire tie

Jump rings and kits for Sue's projects are available from jewelrybysueonline.com



Bracelet

[1] Close two twisted rings and one smooth ring, and open one smooth ring. Continue opening rings throughout the pattern as needed.

[2] With the open ring, pick up a closed twisted ring, a closed smooth ring, and a closed twisted ring. Close the open ring. Run a wire tie through the single closed ring and twist the ends of the wire closed. You have a 1-3 chain (**a**).

[3] Run an open smooth ring through the three rings and close the ring. You now have a 1-3-1 chain (**b**).

[4] Run an open twisted ring through the three rings alongside the last ring added and close the ring. You now have a 1-3-2 chain (**c**).

[5] Run an open smooth ring through the three rings alongside the last ring added so the twisted ring is between the two smooth rings. Close the ring. You now have a 1-3-3 chain (**d**).

Notice how the first set of three rings is composed of a twisted-smooth-twisted ring combination, and the second set of three rings is a smooth-twisted-smooth combination. You will alternate these two combinations throughout the length of the bracelet.

[6] Build the chain to the desired length. Continue adding rings as in steps 3–5, alternating the two-ring combinations.

[7] On each end of the chain, use a single ring to attach the clasp (**e**).

Change the ring combination, using all smooth rings or all twisted rings, or even making the bracelet two-tone if desired. Remember that the chain uses almost seven sets of three rings per inch in whatever combination of rings chosen.

Earrings

[1] Follow steps 1–5 of the bracelet instructions. You will have a 1-3-3 chain in an alternating combination of twisted-smooth-twisted and smooth-twisted-smooth rings.

[2] Repeat steps 3–6 of “Bracelet” until you have a 1-3-3-3-3 chain in the alternating sets of three rings as in the bracelet instructions.

[3] Remove the wire tie. Open the ring that was on the wire and run it through the loop in an earring finding. Close the ring (**f**). Repeat steps 1–3 to make a second earring.

Make the earrings longer or shorter by adding or removing additional sets of three rings to the chain.

Celtic Line bracelet & earrings

The Celtic Line bracelet has an Irish feel to it. The jump rings form circles within circles that are stylish and appealing. A great everyday piece of jewelry, the Celtic Line bracelet is attractive and comfortable.



materials

bracelet, 7 in. (18cm)

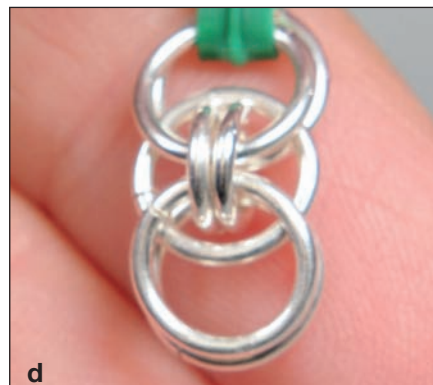
- Sterling silver jump rings
- **56** 18-gauge 6.0mm ID, 8 rings per in. (4 rings per cm)
- **42** 18-gauge 3.5mm ID, 6 rings per in. (3 rings per cm)
- Clasp

earrings

- Sterling silver jump rings
- **16** 18-gauge 6.0mm ID, 8 rings per in. (4 rings per cm)
- **14** 18-gauge 3.5mm ID, 6 rings per in. (3 rings per cm), plus 2 connector rings
- Pair of earring wires

tools

- Chainnose pliers
- Flatnose pliers
- Wire tie



Bracelet

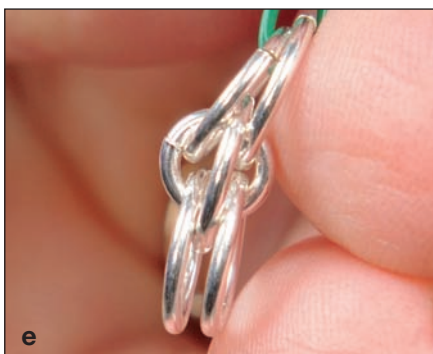
[1] Close two large rings. Run a wire tie through the rings and twist the ends of the wire closed (**a**). Open a pile of small rings and a pile of large rings. Open rings as needed throughout the pattern.

[2] Run an open small ring through the previous two large rings and close the ring. Run another open small ring through the same path. Close the ring (**b**).

[3] Run an open large ring between the two large rings and around the two small rings. Close the ring (**c**). Note that this large ring does not go through any rings, but rather around and between rings. I call this a “floater” ring.

[4] Run an open large ring through the two small end rings, being sure that the large ring is lying on top of the floater ring (**d**).

[5] Turn the chain over and repeat step 4 on the other side of the floater ring. The floater ring is sandwiched between two sets of two large rings (**e**).



[6] Repeat step 2–5 (**f**) until the chain is the desired length. Attach your clasp to each end, placing two small rings through the two end large rings and the clasp.

Earrings

[1] Weave a 1-in. (2.5cm) piece of chain following the bracelet instructions. End the chain with step 5. Attach the chain to an earring wire with two small rings (**g**).

[2] Make a second earring.

Make the earrings any desired length by adding or subtracting rings.



Crazy Eight set

A wonderful combination of color and silver, this original weave has trapped crystals within a cage of rings. I named the weave Crazy Eight because the crystal segments resemble the number eight and the rolling rings add a crazy touch to the chain.



materials

bracelet, 7 in. (18cm)

- Sterling silver jump rings
 - **72** 18-gauge 6.0mm ID, 8 rings per in. (4 rings per cm)
 - **7** 18-gauge 3.0mm ID
 - **7** 18-gauge 4.2 x 6.5mm ID oval
 - **21** 12-gauge 6.5mm ID, 3 rings per in. (2 rings per cm)
 - **12** 6mm round crystals
- Clasp

necklace, 40 in. (102cm)

- Sterling silver jump rings
 - **312** 18-gauge 6.0mm ID, 8 rings per in. (4 rings per cm)
 - **39** 18-gauge 3.0mm ID
 - **39** 18-gauge 4.2 x 6.5mm ID oval
 - **117** 12-gauge 6.5mm ID, 3 rings per in. (2 rings per cm)
 - **78** 6mm round crystals
- Clasp

earrings

- Sterling silver jump rings
 - **16** 18-gauge 6.0mm ID
 - **4** 18-gauge 3.0mm ID
 - **2** 22-gauge 2.0mm ID
- 4 6mm round crystals
- Pair of earring wires

Use round crystals, as other shapes (such as bicones) may fall through the cage.

tools

- Chainnose pliers
- Flatnose pliers
- Wire tie



Bracelet and necklace

[1] Open nine 18-gauge 6.0mm rings and one oval ring. Close a 6.0mm ring and place it on a wire tie. Twist the end of the wire closed **(a)**.

[2] Run an open oval ring through the end ring and close the ring **(b)**.

The oval rings do not always close with as nice a join as a round ring, but do not worry too much about that. The oval ring will be surrounded with 12-gauge rings, and the join will not show.

[3] Run an open 6.0mm ring through the oval ring and close the ring. Run a second 6.0mm ring through the same path and close the ring. You now have a 1-1-2 chain **(c)**.

[4] Open a 12-gauge ring and run it around the oval ring. Close the ring **(d)**. (The new ring fits around the oval and does not fall off the end of the chain because the 6.0mm rings block it.)

[5] Repeat step 4 with two more 12-gauge rings **(e)**. As you are placing these rings, keep pulling the oval ring so it lies lengthwise between the 18-gauge rings on each of its ends. The oval will try to slip sideways, so continue to adjust it until you have all three 12-gauge rings on and closed.



[6] Run two open 6.0mm rings through the two end rings, closing each ring as you go **(f)**. Open a 3.0mm ring and place it on your mat.



[7] While holding the chain between your fingers, spread the end two rings apart **(g)**. You are forming a space for the crystal, which you will place in the next step.



[8] Spread the two inside rings apart and place a round crystal in the space formed by the four rings **(h)**. Hold the rings and crystal in place with your fingers. You may need to pull the last two rings so they lie one on each side of the connecting oval ring where it is attached to the first two 6.0mm rings.



[9] Run the open 3.0mm ring from your mat through the two end rings **(i)**. Close the ring. The crystal is now trapped in the four-ring cage **(j)**.

[10] Run two 6.0mm rings through the 3.0mm ring on the end. Run two more 6.0mm rings through the two end rings **(k)**.





[11] Repeat steps 7–8, trapping another crystal. Repeat step 9, using an open oval ring (**l**) instead of the 3.0mm ring. The pattern is now beginning to repeat.

[12] As you did in step 3, run two 6.0mm rings through the oval ring (**m**). Repeat the pattern from steps 7–13, forming another crystal segment and another oval ring segment. Then add three of the 12-gauge rings as in steps 5–6. Continue repeating these steps for the length of the chain.



[13] When the chain is the desired length, remove the wire tie and attach one half of your clasp on that end by opening the end ring and running it through the clasp (**n**).

For a lobster claw clasp, use the end ring to clasp the piece. For a toggle, attach the second half of the clasp to the remaining end ring.



Earrings

[1] Open eight 6.0mm rings, two 3.0mm rings, and one 2.0mm ring.

[2] Run a 3.0mm ring through the earring finding loop and close the ring (**o**).

[3] Run a 6.0mm ring through the end ring and close the ring. Run a second ring through the same path and close the ring (**p**).

[4] Run a 6.0mm ring through the pair of 6.0mm rings and close it. Repeat with a second 6.0mm ring. You now have a 1-2-2 chain (**q**).

[5] Follow steps 7–10 in “Bracelet and Necklace.”

[6] Follow steps 7–9, using a 2.0mm ring instead of a 3.0mm ring in step 10 to close the end of the earrings (**r**). Make a second earring.



Monty Python bracelet

This original design is a wonderful complement to your jewelry collection. This bracelet reminds me of the undulations of a snake—it is really remarkable how it seems to flow along the wrist.



materials

bracelet, 7 in. (18cm)

- Sterling silver jump rings
 - 24 16-gauge 6.7mm ID, 4 rings per segment
 - 48 18-gauge 5.5mm ID, 8 rings per segment
 - 48 20-gauge 5.0mm ID, 8 rings per segment
 - 28 22-gauge 3.6mm ID, 4 rings per segment plus 4 rings for the end of the bracelet
- Clasp

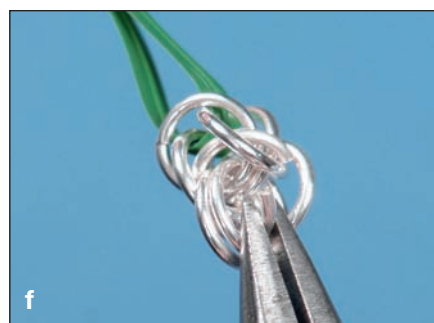
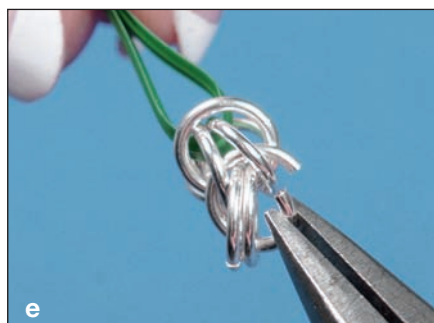
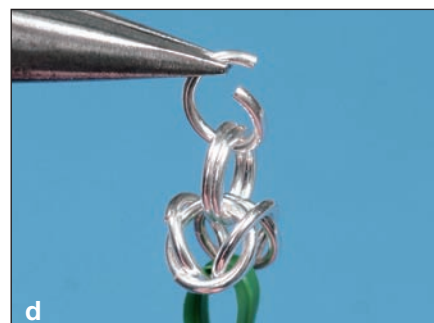
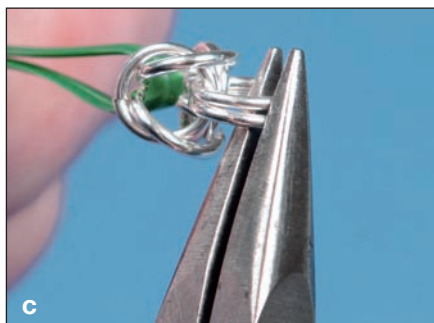
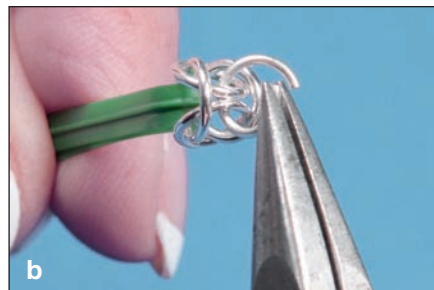
Each segment is longer than 1 in. (2.5cm).

tools

- Chainnose pliers
- Flatnose pliers
- Wire tie

[1] Build a chain segment. Open and lay in individual piles of four rings each: 22-gauge rings, 20-gauge rings, 18-gauge rings, 16-gauge rings, 18-gauge rings, 20-gauge rings, and 22-gauge rings. These 28 rings represent one full segment of the bracelet. Close two of the 22-gauge rings and place them on a wire tie. Run an open 22-gauge ring through the first two rings and close the ring. Repeat with a second ring to make a 2–2 chain **(a)**. This will use all four rings in the first pile of 22-gauge rings. As you build the bracelet, use the sizes of rings in groups of four in the order stated earlier in this step.

[2] Build the bracelet chain. Flip the top two rings down, split the next pair of rings, and place an open ring between the split rings and through the bottom edge of the two flipped rings (which are now on top) **(b)**. Close the ring. Run another ring through the same path and close it **(c)**.



[3] Place a ring through the top two rings. Do not close the ring yet **(d)**.

[4] Before closing, twist the ring around and run it through the two rings of the downward-pointing V, or toward the wire tie **(e)**. Close the ring.

[5] Turn the segment over so that you see the downward-pointing V on the other side of the chain. Run another open ring through the top two rings. Again before closing, twist the ring around and run it through the two rings of the downward-pointing V on the opposite side of the segment. Close the ring **(f)**.



[6] Split the top two rings and place an open ring through the two rings in the center of the split rings (**g**). Close the ring. Run another ring through the same path (**h**). Once you have used all of the rings in the piles, the first segment is complete (**i**).

[7] Repeat step 1 to build another segment, using the last set of 22-gauge rings from the first segment as the beginning set of rings for the next segment; you will weave a set of four rings onto the first segment in each size going in this order: 20-gauge, 18-gauge, 16-gauge, 18-gauge, 20-gauge, and 22-gauge.



[8] Continue building segments as instructed until the chain reaches the desired length (**j**). Remove the wire tie. To attach the clasp, run two 20-gauge rings through the rings at one end of the chain and through one half of the clasp. Repeat on the other end of the bracelet with the other half of the clasp.



Luxurious length

Easily make a necklace by adding segments until you reach the desired length.

Diane Miller

“A girl can be lovely on her own, but add beautiful jewelry and she dazzles!”

Diane Miller lives in Wisconsin with her husband and loves everything about jewelry making; she now focuses on the intricate work of handcrafting different sized jump rings and designing unique new chain mail kits. When Diane is not teaching chain mail classes or selling her finished jewelry at art fairs throughout Southeastern Wisconsin, she enjoys taking long bike rides, visiting with family and friends, and traveling to warm tropical locations.



Celtic Visions pendant

Craft a shiny pendant with jump rings in four sizes, and use a bail to attach your pendant to a piece of leather or rubber cord. For many, this piece evokes the complexity of a Celtic knot. What vision do you see?





materials

pendant, 1 in. (25.5cm)

- Sterling silver jump rings
 - 15 16-gauge (1.3mm), 7.0mm ID
 - 1 16-gauge (1.3mm), 5.5mm ID
 - 26 16-gauge (1.3mm), 4.0mm ID
- Bail

tools

- 2 pairs of chainnose, bentnose, or flatnose pliers
- Needle tool or pick

Kits for all of Diane's projects are available at www.midwestmaille.com.

[1] Close one 5.5mm jump ring (**a**). Open all remaining rings.

[2] Slide a 4mm ring through the closed 5.5mm ring, and close it. Repeat to attach nine more 4mm rings to the closed 5.5mm ring (**b**).

[3] Slide a 7mm ring through two of the 4mm rings, and close it (**c**). Repeat to attach four more 7mm rings to pairs of 4mm rings (**d**).

[4] Slide a 4mm ring through two 7mm rings, and close it. Repeat four times to connect all the 7mm rings (**e**).

[5] Slide a 7mm ring through two of the 4mm rings. Make sure the 4mm jump rings you added in step 4 are sitting in the middle of the new 7mm jump ring you just added. Add four more 7mm jump rings the same way. Close the rings (**f**).

[6] Turn the piece over, and repeat step 5 on this side (**g**).

[7] Slide a 4mm ring through all three layers of 7mm rings, passing it through the "eye" formed where the two outer layers intersect the inner layer. Close the ring. Repeat nine times (**h**).

[8] Slide a 4mm ring through a pair of 4mm rings and a bail, and close it (**i**). String the pendant as desired.

Vortex pendant & earrings

Spin a few jump rings into a whirling spiral of silver that makes a perfect pair of earrings or a simple pendant.



materials

pendant, 1 1/8 in. (29mm)

- Argentium sterling silver jump rings, 16-gauge (1.29mm)
 - 10 9mm ID
 - 2 5.5mm ID
 - 1 3.5mm ID
- Sterling silver bail

earrings

- Argentium sterling silver jump rings, 18-gauge (1.02mm)
 - 14 6mm ID
 - 6 4mm ID
- Pair of sterling silver earring findings

tools

- 2 pairs of chainnose, bentnose, or flatnose pliers
- Needle tool or pick

Pendant

[1] Close a 9mm jump ring and open nine 9mm jump rings. Open two 5.5mm jump rings and one 3.5mm jump ring.

[2] Slide a 9mm jump ring through the closed 9mm ring, and close it. Slide the two jump rings together so the top of ring 2 is behind ring 1 (a).

[3] Add a 9mm ring through the center of the first two rings, and close it (b). Slide ring 3 into position behind ring 2 (c).

[4] Add a fourth 9mm ring through the center of the first three rings (d), and close it. Position the fourth ring behind jump ring 3 (e).

[5] Follow the same pattern to add six more 9mm rings (f).

[6] One at a time, insert the 5.5mm rings through the center of the vortex, and close them. Slide the 3.5mm ring through the 5.5mm rings and through a bail finding. Close the ring (g).



Earrings

[1] Close one 6mm jump ring, and open six 6mm jump rings. Open three 4mm jump rings.

[2] Using 6mm jump rings, follow steps 2–5 of the pendant to make a vortex.

[3] One at a time, insert two 4mm rings through the center of the vortex, and close them. Slide the remaining 4mm ring through the two 4mm rings you just added and through the loop of an earring wire. Close the ring (h). Repeat to make a second earring.

Queen's Link bracelet

Craft a flexible, heavy box chain using cost-savvy sterling silver-plated jump rings. The shining finished bracelet looks and wears just like sterling, but at a prettier price.



materials

bracelet, 7¾ x ½ in. (197x13mm)

- Sterling silver-plated jump rings
 - 66 16-gauge (1.3mm), 6mm ID (large)
 - 64 18-gauge (1.0mm), 5mm ID (medium)

tools

- 2 pairs of chainnose, bentnose, or flatnose pliers
- Needle tool or pick

[1] Open all of the jump rings. Create a 2-in-2-in-2 chain using four large rings and two medium rings (shown in pink). Slide the two medium jump rings in the center, through four closed large rings **(a)**. Close the ring.

[2] Squeeze the two large end rings of the chain between your fingers. Separate the second pair of large rings, positioning one on your index finger and the other on your thumb. The two medium rings are now on top **(b)**.

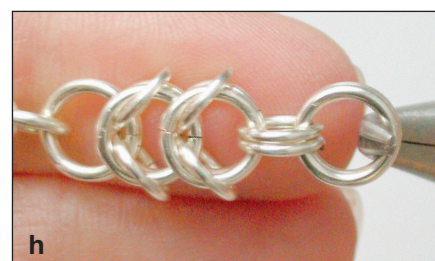
[3] Fold back the two large end rings and hold them between your finger and thumb. Separate the medium top rings to expose the two large rings folded back in step 2 **(c)**.

[4] One at a time, slide two medium rings through this opening, sliding through the tops of the two large rings exposed in step 3 **(d)**. Close the rings.

[5] One at a time, slide two large rings through the two medium rings added in step 4 **(e)**. Close the rings.

[6] Holding the chain in your hand, separate and fold back the two large rings added in step 5 **(f)**.

[7] Fold down the two large rings and hold them between your finger and thumb. Separate the medium top rings to expose the pair of large rings folded back in step 6 **(g)**.



[8] Repeat steps 4–7 until the chain reaches the desired length. Remember to include the clasp measurement when calculating the overall length **(h)**.

[9] Slide a medium ring and the toggle clasp loop through two rings on the end of the chain and close the ring **(i)**. On the opposite end of the chain, slide two medium rings through the two large end rings. Close the rings. Slide a second pair of medium rings through the two previous rings. Slide one medium ring and the toggle bar through the last two rings and close the ring **(j)**.



GSG Chain Mail bracelet

GSG is short for “**Great Southern Gathering**,” an event produced by the Society for Creative Anachronism, an international organization dedicated to researching and re-creating the arts and skills of pre-17th-century Europe. This weave, established at the event, is related to Persian sheet weaves. It may look complicated, but it goes together quickly once you get the hang of the pattern.



materials

bracelet, 7½ in. (19.1cm)

- Argentium sterling silver jump rings, 16-gauge (1.29mm)
 - 108 6mm ID
 - 4 4mm ID
- Clasp

tools

- 2 pairs of chainnose, bentnose, or flatnose pliers
- Needle tool or pick
- Twist tie

[1] Close two 6mm rings, and open 106. Slide the two closed rings onto an open ring, and close it. Arrange so the two closed rings overlap and the one you strung them on goes through the space created where they overlap **(a)**.

[2] Insert a twist tie up through ring 2 and down through ring 1, leaving a loop between the rings. The twist tie will keep the end rings in the correct position, and the loop will identify the front of your chain **(b)**. Always work with the front of the chain facing you.

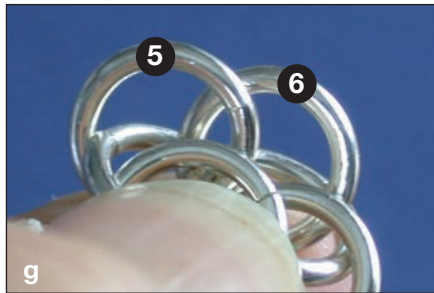
[3] Flip ring 3 to the left **(c)**.

[4] Insert a ring (4) through the center of rings 1 and 2, and close it **(d)**.

[5] Insert a ring (5) through the space created where rings 3 and 4 overlap, and close it. Flip the new ring to the left **(e)**.

[6] Insert a ring (6) through the centers of rings 3 and 4, and close it **(f)**.





[7] Tilt the work so the previous two rings added are positioned as in **(g)**. Slide a ring through the space created where the previous two rings overlap, close it, and flip it to the left **(h)**.



[8] Insert a ring through the centers of the previous pair of rings (see the Xs, photo **i**), and close it. Repeat steps 5–8 until your chain is the desired length.



[9] Insert a 4mm ring through the space created where an end pair of rings overlap, attach half of the clasp, and close the ring. Repeat at the other end of the chain.



Anne Mitchell

“My goal is to try to learn something new every day I spend in my studio.”

Anne was the first instructor to teach ancient chain mail patterns on the national level. She discovered metalwork through an art book from a museum gift shop that depicted images of chain mail patterns throughout history. She began deciphering the intricacies of any mail weave she could find, staring at the patterns until she could see how they wove together. Anne's 16-year journey in metals has taken her from an in-depth exploration of ancient chain mail patterns to a study of traditional metalsmith techniques and currently, to fine-silver metalworking.



Double-Cross Link bracelet

During a trip to the silver markets of Taxco, Mexico, the region that supplied silver to the Spanish court in the 1500s and is a living monument to the art of working with silver, a double-cross link chain created by a local artist caught my eye. This design is popular with novices because it produces a polished look and presents satisfying challenges.





In these photographs, the rings that join the sections of jump rings are black to help you see them more clearly.

[1] Assemble 2+2+2 links: Prepare to assemble the bracelet links by closing 84 and opening 42 jump rings.

[2] Scoop up four closed rings on one open ring **(a)** and close the open ring.

[3] Repeat the path with a second open ring **(b)** for a strand of three sets of links with two rings in each section. This is called a 2+2+2 link **(c)**. Assemble 21 2+2+2 link sections for a 7-in. (18cm) bracelet.

[4] Join the sections: Open 40 rings. These will be used to join the 2+2+2 link sections. Position two 2+2+2 link sections with one centered above the other to form a T-shape **(d)**.

[5] To help describe the next step, I will call the cross section at the top of the T “Part A” and the vertical section below it “Part B.” Attach these two sections, using the newly opened jump rings. First, connect the top rings of Part B to one of the side rings of Part A. Connect the same top rings of Part B to the other set of side rings on Part A **(e, f)**.

[6] Place another 2+2+2 link at a 90-degree angle at the base of the section you just finished assembling. Use two open rings to attach this link in the same fashion **(g)**.

[7] Continue connecting the 2+2+2 link sections in this manner until you reach the desired length for your bracelet **(h)**.

[8] Attach the clasp: Use jump rings to connect the final links at either end of your bracelet to the clasp pieces. If using a lobster claw clasp instead of

the toggle clasp shown, add a jump ring on the opposite end to act as the loop. Be sure to end the pattern so the chain can lie flat **(i)**.

materials

bracelet 8 in. (20 cm)

- 170 (approx.) sterling silver 3.0mm ID 18-gauge jump rings
- Sterling silver toggle or lobster claw clasp

tools

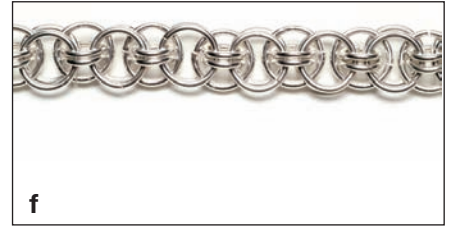
- Bentnose pliers
- Chainnose pliers

Jump rings for all of Anne's projects are available from annemitchell.net

Chain Mail Overlay bracelet

Layered jump rings provide depth and form intriguing shapes in this bracelet. A basic 2+2 chain forms the foundation of this chain, but you'll layer jump rings to create the visual depth that takes this piece from straightforward to smashing. Although the bracelet looks intricate, the steps are easy to follow because you'll add one ring at a time.





positioning it between the two layers of 7.5mm rings (e). Close the ring. Repeat along the length of the chain (f).

[5] Open 64 5mm rings. Thread a 5mm ring through the opening created by the overlap of the three layered 7.5mm rings (g), and close the ring. Repeat along this edge of the chain, then repeat along the opposite edge (h).

[6] Open 30 3mm rings. Starting on one end of the chain and skipping the first 5mm ring, thread a 3mm ring through the second and third 5mm rings (i). Close the ring. Continue connecting pairs of rings, skipping the last 5mm ring. Repeat along the opposite edge of the chain, skipping the first and last rings.

[7] Open a 5mm ring, and thread it through the first pair of 7.5mm rings on one end of the chain and through one half of a clasp (j). Close the ring.

[8] Open a second 5mm ring, thread it through the pair of 7.5mm rings on the other end of the chain, and close the ring (k).

materials

bracelet 8 in. (20cm)

- Sterling silver jump rings
 - 50 16-gauge, 7.5mm ID
 - 98 16-gauge, 5.0mm ID
 - 30 18-gauge, 3.0mm ID
- Clasp

tools

- Chainnose pliers
- Bentnose pliers

[1] Close 34 7.5mm jump rings and open 32 5mm jump rings. Thread four 7.5mm rings on one 5mm ring (a), and close the ring. Thread a second 5mm ring through the same four 7.5mm rings (b).

[2] Thread a 5mm ring through two of the 7.5mm rings, and add two more 7.5mm rings (c). Close the ring. Thread a second 5mm ring through those same four 7.5mm rings, and close the ring (d).

[3] Repeat step 2 until the chain is the desired length. For an 8-in. (20cm) bracelet, use all of the rings indicated in step 1.

[4] Open 16 7.5mm rings. Starting at one end of the chain, loop a 7.5mm ring around the end two 5mm rings,

Beyond Chain bracelet & necklace

Combine two classic chain mail techniques—Japanese Overlay and Corduroy Weave—to make an unusual chain with layers and a flat base. Add color to the chain with crystals, as shown here, or substitute glass beads, semiprecious stones, or freshwater pearls.



materials

bracelet 8 in. (20cm)

- 23 (approx.) sterling silver jump rings, 10.0mm ID, 15-gauge wire
- 86 (approx.) sterling silver jump rings, 5.5mm ID, 17-gauge wire
- 11 6mm round crystals
- Lobster claw clasp
- 2 crimp beads
- Flexible beading wire, .014

choker 14 in. (36cm)

- 63 (approx.) sterling silver jump rings, 10.0mm ID, 15-gauge wire
- 172 (approx.) sterling silver jump rings, 5.5mm ID, 17-gauge wire
- 22 6mm round crystals
- Lobster claw clasp
- 2 crimp beads
- Flexible beading wire, .014

tools

- Chainnose pliers
- Bentnose pliers
- Crimping pliers
- Wire cutters



[4] Separate the four rings in a four-in-one set into two pairs. Flip one pair of rings so they are side by side on your work surface **(b)**. Slide a 10mm ring through the two side-by-side 5.5mm rings **(c)**.

[5] Close the 10mm ring, and tape it to your work surface so the rings are easier to position. Flip the other pair of 5.5mm rings toward each other. The inside edge of the rings will touch, and the rings will not lie flat **(d)**.

Bracelet

[1] Connect the jump rings: Close 44 and open 11 5.5mm jump rings.

[2] Slide four closed 5.5mm rings on an open 5.5mm ring **(a)**. Close the ring. Repeat with the remaining rings to make 11 four-in-one sets.

[3] Open 12 10mm rings.

[6] Repeat step 4. Connect the new 10mm ring to the available pair of 5.5mm rings on the previous four-in-one set. Remove the tape, close the 10mm ring, and flip the next pair of 5.5mm rings as in step 5 **(e)**.



[7] Continue connecting four-in-one sets with the remaining 10mm rings from step 3 (**f**). You won't need to secure the chain to your work surface. Connect the last 10mm ring to the end pair of 5.5mm rings.

[8] Open 20 5.5mm rings.

[9] Starting at the second 10mm ring on the chain, slide a 5.5mm ring through the top two 5.5mm rings within the 10mm ring (**g**). Close the 5.5mm ring, and repeat with the bottom two 5.5mm rings (**h**). Continue along the length of the chain.

[10] Close one 5.5mm ring, and open 10 5.5mm rings.

[11] Working on one end of the chain, connect two 5.5mm rings to the end 10mm ring. Flip the rings as shown, and connect the lobster claw clasp to

the two 5.5mm rings using a third ring (**i**). Connect two rings to the 5.5mm rings within the end 10mm ring, as in step 9 (**j**).

[12] Repeat step 11 at the other end of the chain, substituting the closed 5.5mm ring for the lobster claw clasp.

[13] Open 11 10mm rings.

[14] Starting at one end, slide a 10mm ring through the vertical 5.5mm rings in the centers of the first two 10mm rings (**k**). Close the ring. Repeat along the chain (**l**). **Photo m** shows the side view of the finished chain.

Color pop

Crystals nestled within a sterling silver bracelet and choker add a lively burst of color.





[15] String the crystals: Cut a 1-ft. (30cm) length of flexible beading wire, and string a crimp bead. Starting at one end of the chain, slide the end of the wire between the two vertical 5.5mm rings and up through the center of the 10mm ring. Bring the wire back through the crimp bead. Position the crimp bead next to the 10mm ring, crimp the crimp bead (Basics), and trim the wire tail as close to the crimp bead as possible (**n**).

[16] String a crystal, and bring the end of the wire under the other side of the 10mm ring, between the next two vertical 5.5mm rings, and out through the center of the next 10mm ring (**o**).

[17] Pull on the wire, popping the crystal into the center of the first 10mm ring (**p**).

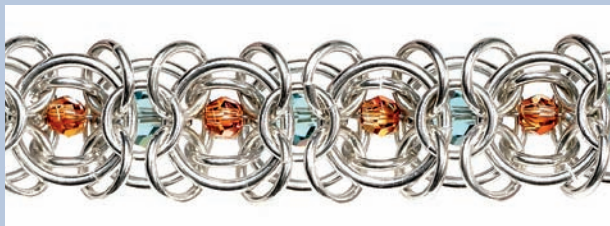
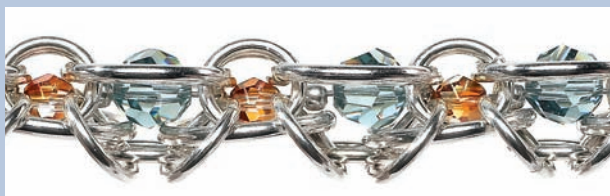
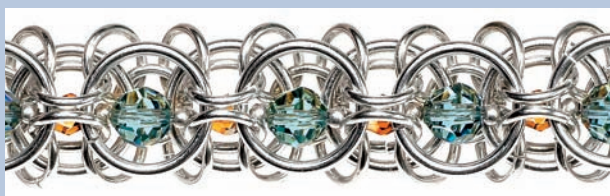
[18] Repeat steps 16 and 17 along the chain. String a crimp bead after the last crystal, and crimp the wire to the other end as in step 15.

Choker

Follow the directions for the bracelet, using the number of jump rings necessary to reach your desired length. When stringing the crystals, use a length of flexible beading wire 4 in. (10cm) longer than the chain length.

Technique Tip

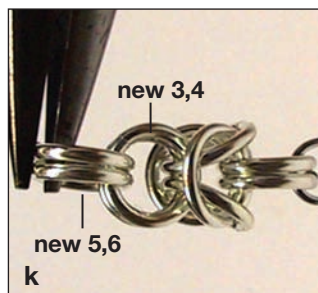
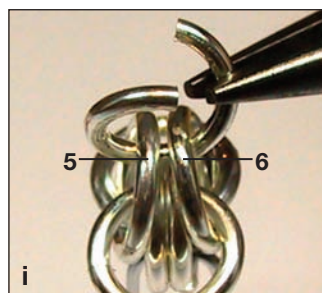
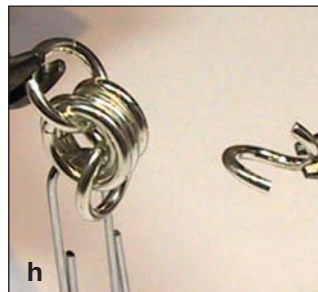
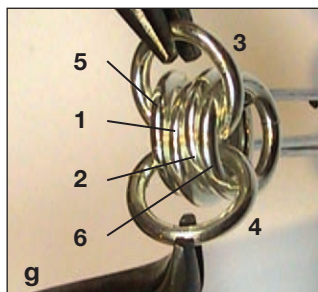
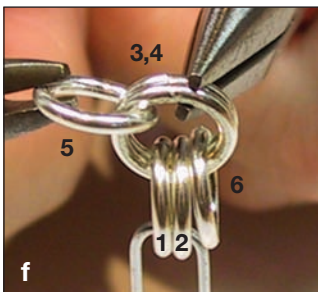
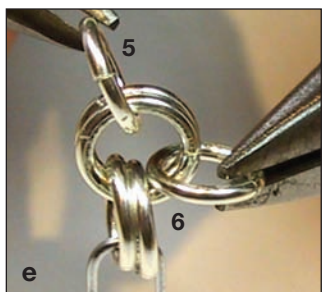
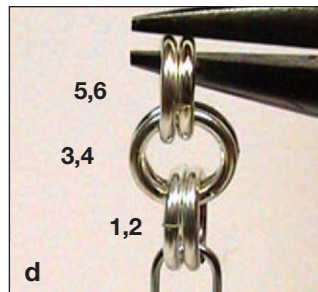
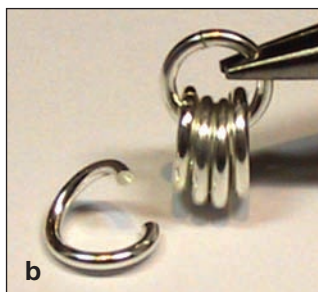
To keep the crystals from sliding inside the chain and to hide the beading wire between the crystals, adapt the instructions as follows: Work steps 15–17. String a 2mm round silver bead, a 4mm crystal, and a 2mm bead. Position the crystal under the two 5.5mm rings. Repeat this pattern, ending with a crimp bead instead of a 2mm bead. The photos below show the crystals' placement on the top, side, and bottom of the chain.



Ancient Links necklace

Blending Byzantine and Queen's Link chain-making techniques results in a simple yet stunning necklace. The patterns are remarkably similar, so combining them in one piece is a natural evolution. Though the instructions alternate the Byzantine and Queen's Link, you can make a bracelet or necklace in either of the patterns or change the lengths of the sequences as desired.





Begin the necklace

[1] Use the large (5.5mm) jump rings for this section of the necklace. Close four and open two rings (**a**).

[2] Slide the four closed rings onto one open ring. Close the open ring (**b**).

[3] Repeat step 2 with the remaining open ring (**c**).

[4] Bring the two rings closed in steps 2 and 3 together, then separate the four rings strung in step 2 into two sets of two. This strand of three sets of two links each will be called a 2+2+2. Link a paper clip on one end of the strand to weight and stabilize the strand it, making the chain easier to construct. (This will also make it easier to find the beginning of the

necklace when—not if!—you accidentally drop it.) Mentally number the rings in the following order: The rings with the paper clip are 1 and 2; the middle rings are 3 and 4; and the top rings are 5 and 6 (**d**).

Create the Queen's Link sequence

[5] Open 32 large jump rings. Grasp rings 5 and 6 with the bentnose pliers in your recessive hand; curve the tips of the pliers toward your work. With chainnose pliers in your dominant hand, flip one of the 5/6 rings out from the jaws of the bentnose pliers (**e**) and let it fall to one side.

[6] Grasp rings 3 and 4 with the chainnose pliers (**f**). Let the remaining 5/6 ring fall to the opposite side.

[7] With the bentnose pliers in your recessive hand and the chainnose pliers in your dominant hand, grasp rings 3 and 4, one ring in each plier, and spread them apart so you can see all four remaining rings lined up between rings 3 and 4. The order of the rings is 5, 1, 2, 6 (**g**).

[8] Drop the ring held with your dominant hand and hold one ring in the bentnose pliers with your recessive hand. Using the chainnose pliers in your dominant hand, pick up one open ring (**h**).

[9] Scoop up rings 5 and 6 with this new ring (**i**). Be careful not to include rings 1 and 2 in the open ring. Drop the ring held

materials

necklace 18½–19 in.
(47.0–48.3cm)

- 350 (approx.) 5.5mm ID 16-gauge sterling silver jump rings
- 130 (approx.) 4.0mm ID 16-gauge sterling silver jump rings
- Sterling silver lobster claw clasp

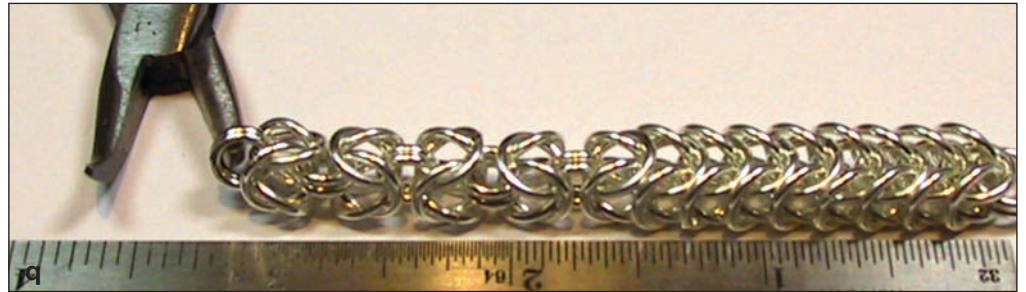
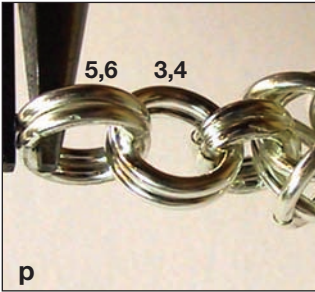
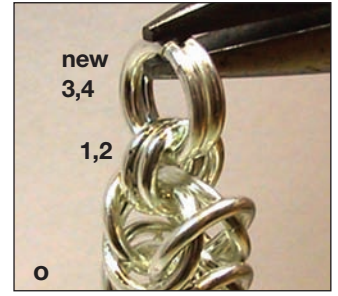
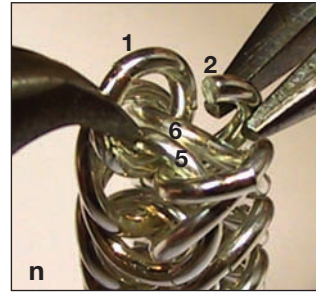
tools

- Chainnose pliers
- Bentnose pliers
- Paper clip
- Ruler

with the bentnose pliers. Close the new jump ring.

[10] Repeat step 9 using another open jump ring. These rings will be the new 3 and 4 (**j**).

[11] Hold the new rings 3 and 4 in your recessive hand using the bentnose pliers. Add two new jump rings onto 3 and 4. These rings (**k**) will be your new 5 and 6. This completes one Queen's Link sequence.



[12] Repeat the Queen's Link sequence for approximately 1½ in. (3.8cm) or until you've used all 32 opened rings **(l)**. End the sequence holding a new 5 and 6. (If you want to make a necklace entirely of the Queen's Link, simply continue until you reach the desired length and then proceed to "Add closure," below.)

Create the Byzantine sequence

[13] Open 10 4mm rings and 16 large 5.5mm rings.

Grasp rings 5 and 6 (from the end of the Queen's Link sequence) with the bentnose pliers in your recessive hand, having the tips of the pliers curved toward your work. Using the chainnose pliers in your dominant hand, flip one of the 5/6 rings out from the jaws of the bentnose pliers and let it fall to one side, as in step 5. Grasp rings 3 and 4 with the chainnose pliers. Let go of the remaining 5/6 ring and let it fall to the opposite side, as in step 6.

With the bentnose pliers in your recessive hand and the chainnose pliers in your dominant hand, grip rings 3 and 4, one ring in each plier, and spread them apart so that they are off to each side and you can see all four remaining rings lined up between rings 3 and 4, as in step 7. The order of the rings is 5, 1, 2, 6.

[14] Drop the ring held with your dominant hand. Continue holding one ring in the bentnose pliers with your recessive hand. Using the chainnose pliers in your dominant hand, pick up a small open jump ring. Place the small ring through rings 5 and 6 **(m)**. Be careful not to scoop up rings 1 and 2. Drop the ring held with the bentnose pliers and close this new jump ring using both pliers.

[15] Repeat step 13 using another open small jump ring. These rings are the new 1 and 2 **(n)**.

[16] Hold the new rings 1 and 2 in your recessive hand using the bentnose pliers. Add two large jump rings onto 1 and 2. These two new rings will be your new 3 and 4 **(o)**.

[17] Add two more large jump rings onto 3 and 4. These two new jump rings will be 5 and 6 **(p)**. You have completed one Byzantine sequence.

[18] Repeat the entire Byzantine sequence until you have used 10 small rings and 16 large rings **(q)**.

[19] Alternate the Queen's Link and the Byzantine sequences until you reach the desired length for your piece. Each subsequent Queen's Link sequence requires 36 large rings to be opened, and the

Byzantine sequence requires 10 small and 16 large rings to be opened. Open only the required number of rings for each sequence as you work; this will keep your section lengths even and your work surface tidy so you won't get confused.

Add closure

[20] Scoop up the last two large rings with a small ring. Loop the small ring through the clasp and close the ring. Loop another small ring through the two rings joined with a paper clip. Close the ring and remove the paper clip.

John Fetvedt

“Chain making combines art, mathematics, and construction.”

John works in chain making, metal forming, casting, forging, and stone setting, among other areas. Chain making is of particular interest to him as each pattern combines art, in the way the finished jewelry decorates the body; mathematics, in calculating the ring size to use when changing the gauge or pattern; and construction techniques, like solving a jigsaw puzzle. John’s mentors include Mary Ann Scherr, Blaine Lewis, Charles Lewton-Brain, Cynthia Eid, Thomas Mann, and Betty Helen Longhi.



Half-Byzantine hoop earrings



Funky, swinging hoop

earrings have cycled in and out of fashion for as long as people have been wearing jewelry. This new take on the trend moves toward a more subtle style, with three larger hoops linked in a tapered shape by half of a Byzantine chain pattern. It's the gauge of the larger jump rings that allows them to fit inside the connecting rings, so if you want a bolder look, you can increase the diameters of the larger rings as much as you wish as long as you keep their gauge the same.



[1] Close two 6.5mm jump rings, two 9.5mm jump rings, and two 13mm jump rings (**a**). To give your earrings a more finished look, permanently close the cuts in these jump rings by fusing or soldering them. (See “Fuse or Solder?” right.)

[2] Thread a 3mm ring onto a 13mm ring and close it; repeat with another 3mm ring. Thread a 3mm ring through the first pair of 3mm rings and close it; repeat with a second 3mm ring (**b**).

[3] Flip the second pair of 3mm rings back, one to each side of the first pair. Insert a needle tool or pick above the 13mm ring to hold the first pair of rings apart and expose the second pair (**c**).

materials

earrings 2½ in. (64mm)

- Sterling silver jump rings
 - 32 20-gauge (0.8mm), 3mm ID
 - 2 16-gauge (1.3mm), 6.5mm ID
 - 2 16-gauge (1.3mm), 9.5mm ID
 - 2 16-gauge (1.3mm), 13mm ID
- Pair of earring wires

Kits for all of John’s projects are available at bijoux-de-terre.com

tools & supplies

- 2 pairs of chainnose, bentnose, or flatnose pliers
- Needle tool or pick
- Torch station (optional): torch, paste solder (medium), soldering pad or firebrick, pickle pot with pickle, quench bowl, copper tongs, pick
- Tumbler, steel shot, burnishing compound (optional)

Fuse or Solder?

You don’t need a complex torch setup to fuse or solder jump rings—a handheld butane torch and a soldering surface will do. Relatively inexpensive butane torches are available at most hardware stores.

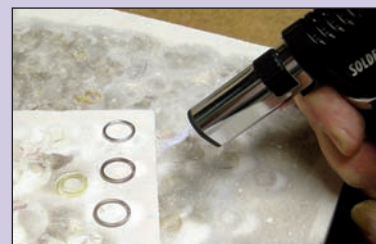
If your jump rings are made of Argentium sterling silver or fine silver, you can either fuse or solder them. (I find that fusing the rings results in a smoother seam.) If your jump rings are made of sterling silver or gold, they can only be soldered.

To fuse your jump rings, first close them, making sure that the ends are aligned and tightly abutting each other. Lay the rings on a soldering pad or firebrick with the cuts facing toward you.

Working on one ring at a time, gently heat the whole ring by moving your torch in a circular motion, then concentrate the point of the flame on the cut. When the area on either side of the cut turns cloudy, the metal is almost hot enough to fuse, so get ready to move the torch away. As soon as the metal at the join becomes shiny and the join appears somewhat less defined, remove the torch.

The join may not disappear completely, but the ring will be fused. If you’re using Argentium sterling, let the rings cool a bit before you quench them; Argentium sterling is somewhat fragile when it’s hot.

To solder jump rings, first close them, and make sure the ends are aligned and tightly abutting each other. Lay the rings on a soldering pad or firebrick, with the cuts facing away from you. Dab a small amount of paste solder to the inside of each cut. Turn the board or brick so the cuts are facing you.



Working on one ring at a time, gently heat the whole ring; then concentrate the tip of the flame on the cut. The solder will melt and move toward the heat of the torch. Remove the torch as soon as the solder has flowed into the join. Quench, pickle, and rinse.

Color Combinations

For a silver-and-gold look, use gold-filled jump rings for either the 3mm connecting rings or for the larger rings. If you plan to close the cuts in your gold-filled rings, you'll need to solder them shut instead of fusing them. When you're soldering, use gold paste solder of the same karat as your gold-filled jump ring to avoid having a jump ring that sports two different colors of gold.

To add unexpected color to your earrings, try using anodized titanium, niobium, or aluminum for your 3mm connecting rings.



Mixed metals

For variety, try combining silver and gold-filled rings.



[4] Insert a 3mm ring alongside the needle tool. Slide a 9.5mm ring onto the 3mm ring, and close the 3mm ring. Remove the needle tool, and thread and close a second 3mm ring alongside the first one **(d)**.

[5] Thread two 3mm rings onto the 9.5mm ring and close them. Thread two more 3mm rings through the previous pair and close them. Flip the second pair of rings back, one to each side of the first pair. Insert the needle tool above the 9.5mm ring to hold the first pair apart and expose the second pair **(e)**.

[6] Insert a 3mm ring alongside the needle tool. Slide a 6.5mm ring onto the 3mm ring, and close the 3mm ring. Remove the needle tool, and thread and close a second 3mm ring alongside the first one **(f)**.

[7] Thread two 3mm rings onto the 6.5mm ring and close them. Thread two more 3mm rings through the previous pair and close them. Flip the second pair of rings back, one to each side of the first pair. Insert the needle tool to

hold the first pair apart and expose the second pair. Open the loop of an earring wire and insert the loop alongside the needle tool. Close the loop and remove the needle tool **(g)**.

[8] Repeat to make a matching earring. It is important that you start each earring with the 13mm rings so that the direction of the Byzantine pattern will be the same on both earrings. Burnish your earrings in a tumbler with steel shot and burnishing compound, if desired.

Mixed-Metal Double-Barrel bracelet

Barrel chain is an elementary chain mail pattern that uses just one jump ring size in a straightforward weave. But you can use the same simple pattern to make a complex-looking chain. Because barrel chain has a naturally diagonal orientation when it's worn, two barrel chains side by side will nest together, forming a dense pattern with a lovely, fluid drape. To make the look even richer, you can mix and match anodized niobium jump rings within the weave.





[1] Place a two-strand clasp on your work surface. Using two pairs of pliers, open two 3.2mm jump rings, and attach one to each loop on one side of the clasp (**a**).

[2] Using one of the 3.2mm rings as the first ring in a chain, make the first



link of a barrel chain (see “Basic Barrel Chain,” below) using 4.4mm Argentium and niobium rings (**b**).

[3] Starting with the second 3.2mm ring on the clasp, make the first link of a second barrel chain (**c**).



In my bracelet, all the horizontal jump rings are Argentium, and all the vertical jump rings are niobium. You can, of course, create this pattern using all one metal, or mix and match metals.

Basic Barrel Chain

This chain is also known as a “Double Vision Chain,” and uses jump rings with an aspect ratio of 3.4.

Thread scrap wire, a twist tie, or a paper clip through one closed jump ring (green in the example below). Thread a second ring (blue) through the

first ring, and close it. Then thread a third ring (red) through the second, and close it. Repeat to thread a fourth ring (red) through the second ring (blue) (**a**).

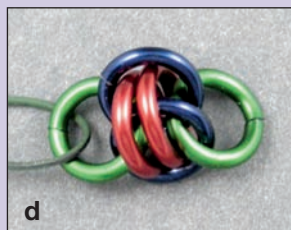
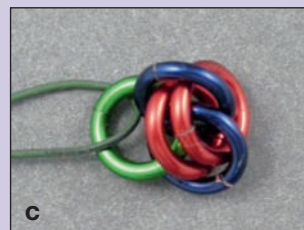
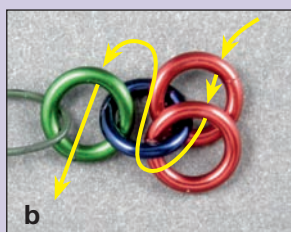
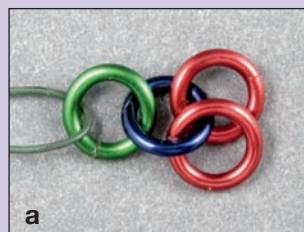
Here’s the path (**b**) for the next ring: Thread a fifth ring up through the back of the paired

rings at the end of the chain and then through the back of the first ring on the chain. This action pushes the red rings upward into their horizontal position to make the barrel (**c**).

NOTE: If it’s more comfortable for you to thread your fifth ring through the front of the paired rings, be sure to thread it through the front of the first ring, and close it at the back of the pattern. Whichever threading direction you choose, be sure to maintain that same direction for the whole length of the chain.

Close a sixth ring through both of the rings at the working end of the chain (**d**). This completes one barrel link. The last ring of this link will act as the first ring of the next link (**e**).

For this project, I used niobium jump rings in place of the red rings in the basic barrel chain tutorial, and Argentium jump rings in place of the blue and green rings.



Burnishing Chains

SAFETY NOTE: Never attempt to use a polishing wheel or any powered rotary device to polish chains. Chains can cause serious injury if they catch in a high-powered wheel.

The best way to polish a chain is to burnish it in a small tumbler with stainless steel shot and a burnishing liquid. I have found that 30 minutes of tumbling is usually adequate. When I'm working with niobium jump rings, I shorten that time to 20 minutes to avoid damaging the niobium's vivid colors.

I use a Lortone Model 3-1.5B tumbler in my studio, and I use a tumbler from Harbor Freight in my classes and workshops. I use a barrel from the Lortone tumbler (it's a little smaller than the Harbor Freight barrel) in both tumblers, and 2 lb. (0.907 kg) of stainless steel mixed shot with Super Sunsheen Burnishing Compound. (Make sure you get stainless steel shot, or you'll spend all of your time trying to keep your shot clean.) Since I use my tumbler nearly every day, I leave the used shot in the barrel, covered with the burnishing compound, until I'm ready to use the tumbler again. Then, I rinse the barrel and shot in water and use fresh burnishing compound for its next use.



[4] Attach a second barrel link to each of the two chains **(d)**.

[5] Thread a 4.4mm niobium ring through the single ring that connects the first and second barrel links of each chain, and close it **(e)**.

[6] Add a third barrel link to each of the two chains, and use a niobium jump ring to connect the single Argentium ring between the second and third barrel links of each chain **(f)**.

[7] Continue adding barrel links to each of the two chains, connecting the two chains after adding each new pair of barrel links, until the bracelet is the desired length. Use the remaining two 3.2mm Argentium rings to connect the end of each chain to the clasp **(g)**.

Tumble-polish the bracelet for 20 minutes (See "Burnishing Chains," right).

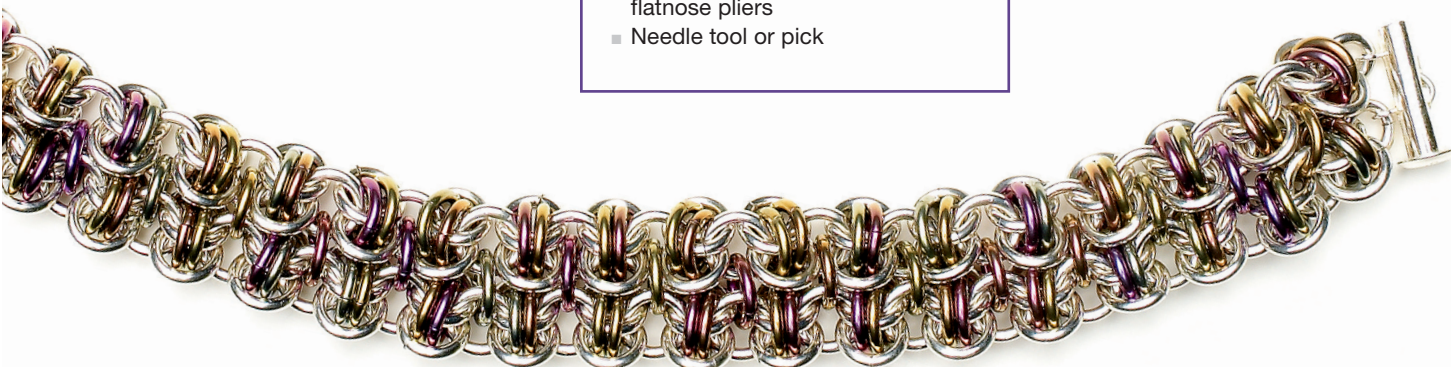
materials

bracelet 7½ in. (19.1cm)

- Argentium sterling silver jump rings:
 - 148 16-gauge (1.3mm), 4.4mm ID
 - 4 16-gauge (1.3mm), 3.2mm ID
- Niobium jump rings:
 - 124 16-gauge (1.3mm), 4.4mm ID
- Sterling silver 2-strand clasp

tools

- 2 pairs of chainnose, bentnose, or flatnose pliers
- Needle tool or pick



Double-Cross Chain set

Pair tiny silver and niobium rings to make a dainty jewelry set.



materials

anklet 9½ in. (24.1cm);
bracelet 7¾ in. (19.7cm)
earrings

- Sterling silver jump rings:
 - 20-gauge (0.81mm), ⅜ in. ID (A rings): **232** for anklet, **184** for bracelet, **32** for earrings
 - 18-gauge (1.02mm), ⅛ in. ID: **1** for anklet or bracelet
 - 18-gauge (1.02mm), ⅜ in. ID: **1** for anklet or bracelet
- Niobium jumpbrings (B rings):
 - 20-gauge (0.81mm), ⅜ in. ID: **78** for anklet, **62** for bracelet, **12** for earrings
- Lobster claw clasp for anklet or bracelet
- Pair of earring wires

tools

- 2 pairs of chainnose, bentnose, or flatnose pliers
- Needle tool or pick

Anklet or bracelet

[1] To make an anklet, open 232 ⅜-in. sterling silver jump rings (A rings) and close 78 ⅜-in. niobium jump rings (B rings). To make a bracelet, open 184 A rings and close 62 ⅜-in. niobium jump rings (B rings). For either piece, close a ⅛-in. sterling silver jump ring, and attach a scrap piece of beading wire to it **(a)**.

[2] Build a 2+2+2 chain, using two As, two Bs, and two As **(b)**.

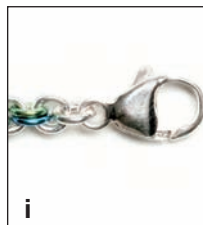
[3] Attach an A to the end pair of As. Add an A to double it **(c)**.

[4] Separate the pair of As just added, and attach an A and a pair of Bs to one of them. Double the A **(d)**.

[5] Slide an A through the remaining A from step 3 and the pair of Bs added in step 4. Double the new A **(e)**.

[6] Attach an A to each end pair of As **(f)**.

[7] Attach an A and two Bs to the As added in step 6. Double the new A **(g)**.



Earrings

Open 32 ⅜-in. sterling silver jump rings (A rings) and close 12 ⅜-in. niobium jump rings (B rings). Follow steps 2–8. Open the loop of an earring wire, attach an end pair of As, and close the loop **(j)**. Make a second earring.

Note: “Double” simply means follow the same path with a second, same-size ring.

[8] Attach an A to the end pair of Bs. Double the A. Repeat steps 3–8 until the chain is the desired length **(h)**.

[9] Open a ⅜-in. 18-gauge ring, attach it to the end pair of As and a clasp, and close the ring **(i)**. If desired, tumble-polish the chain in a tumbler with stainless steel shot and burnishing compound.

Graceful Chain earrings

To create supple, tapered earrings that drape like fabric, you'll weave fine-gauge jump rings in this European 4-in-1 pattern. You can change the length of the earrings by adding or removing five-ring rows. For an alternate look, try adding a top-drilled bead on the bottom jump ring.





To make it easier for you to understand the pattern, the photos show colored jump rings that are larger than the size you'll actually use. For the actual earrings, you'll likely want to use jump rings in all one color.

[1] Open 138 or 188 jump rings and close the remaining two. (For a pair of 1½-in./3.8cm earrings, you'll use 140 rings. For 2-in./5cm earrings, you'll use 190 rings.) Set aside one closed ring and half of the open rings for the second earring (see note, page 50).

[2] String a closed (blue) jump ring on a scrap piece of wire or paper clip; you can hold onto this as you work.

[3] Close two (red) rings around the first (blue) ring (**a**).

[4] Working the third row of rings from left to right, thread a (blue) ring through the first (red) ring on the left (**b**) and close the (blue) ring.

Thread a (blue) ring through the first and second (red) rings (**c**), and close

the ring. The new ring should overlap the (blue) ring previously added.

Thread a (blue) ring through just the second (red) ring (**d**), and close it. The new ring should overlap the previously added ring.

[5] Working the fourth row of rings from right to left, thread a (red) ring through the first (blue) ring (**e**), and close the ring.

Thread a (red) ring through the first and second (blue) rings (**f**), making sure this new (red) ring overlaps the first ring in this row. Close the ring.

Thread a (red) ring through the second and third (blue) rings (**g**), making sure the new (red) ring is overlapping the others. Close the ring.

Thread a (red) ring through the third (blue) ring (**h**), and close the ring.

[6] Work the fifth row of five rings from left to right, repeating the established

materials

earrings

1½ in. (3.8cm) or 2 in. (5cm)

- 140 or 190 22-gauge jump rings, 2.4mm inside diameter
- 2 top-drilled beads (optional)
- Pair of earring wires

tools & supplies

- 2 pairs of chainnose, bentnose, or flatnose pliers
- Tumbler, stainless steel shot, and burnishing compound

pattern: Go through the first (red) ring with the first (blue) ring. Go through the first and second (red) ring with the second (blue) ring. Go through the second and third (red) ring with the third (blue) ring. Go through the third and fourth (red) ring with the fourth (blue) ring. Go through the fourth (red) ring with the fifth (blue) ring (**i**).



[7] Working right to left, add another row of five rings: Go through the first (blue) ring with the first (red) ring. Go through the first and second (blue) rings with the second (red) ring. Go through the second and third (blue) rings with the third (red) ring. Go through the third and fourth (blue) rings with the fourth (red) ring. Go through the fourth and fifth (blue) rings with the fifth (red) ring (**j**).

At this point in the pattern, you are no longer lengthening the rows, so, unlike previous rows, you don't close a ring around the single last ring in the row.

[8] Repeat step 7 to add five-ring rows, working back and forth. For the shorter earrings, work a total of 10 five-ring rows. For the longer earrings, work 15 five-ring rows.

[9] After the desired number of five-ring rows are in place, you'll want to decrease the ring count for each row. To do this, don't thread any rings through a single jump ring in the previous row; just connect pairs of

rings in the previous row. For the four-ring row, close new rings through the first and second rings, second and third rings, third and fourth rings, and fourth and fifth rings (**k**).

[10] For the three-ring row, close new rings through the first and second rings, second and third rings, and third and fourth rings (**l**).

[11] For the two-ring row, close new rings through the first and second rings, and second and third rings (**m**).

[12] For the single-ring row (**n**), thread a top-drilled bead on the ring, if desired, and close the ring around the two rings in the previous row, making sure the ring lies correctly.

[13] Remove the wire or paper clip from the first jump ring. Open the loop of an earring wire, attach the top ring of the earring, and close the loop.

[14] Make a second earring in the mirror image of the first by working step 4 from right to left. Position the rings so they overlap as shown (**o**). Remember that the new row always starts with the last ring added to the previous row.

[15] To polish the earrings, put them in a tumbler with steel shot and burnishing compound for two hours.

Technique Tip

Try this technique to keep track of all the jump rings:

- Separate the rings into piles. Make a pile of 10 rings for the first four rows and 10 rings for the last four. Put the remaining rings in five-ring piles.

Vanessa Walilko

“I love chain mail because of the rhythmic process involved with its creation.”

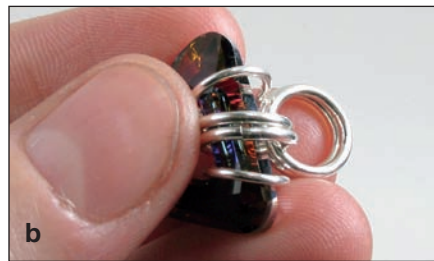
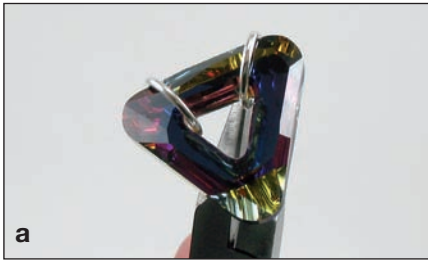
A designer of chain mail jewelry and wearable art, Vanessa continually seeks ways to push the boundaries of the art form. Her work explores the interplay of fashion and armor, and how we construct our identity through what we wear. Her chain mail fashion designs have won international awards and have been featured in exhibitions throughout North America, Australia, and England.



Art Deco necklace

The clean, elegant lines of graduated box chain pair with geometric details to celebrate the art and architecture of a bygone era.





materials

necklace 17 in. (43.2cm)

- Sterling silver, copper, or gold-filled jump rings:
 - 6 1/4-in. ID, 18-gauge (1.02mm) (ring A)
 - 18 1/4-in. ID, 16-gauge (1.29mm) (ring B)
 - 12 9/32-in. ID, 16-gauge (1.29mm) (ring C)
 - 48 7/32-in. ID, 17-gauge (1.15mm) (ring D)
 - 48 11/64-in. ID, 19-gauge (0.91mm) (ring E)
 - 48 9/64-in. ID, 20-gauge (0.81mm) (ring F)
 - 24 1/8-in. ID, 21-gauge (0.72mm) (ring G)
 - 4 5/32 in. ID, 18-gauge (1.02mm) (ring H)
 - 1 7/32-in. ID, 14-gauge (1.63mm) (ring I)
- 10 in. (25.4cm) sterling rope chain
- figure-8 clasp
- 3 20mm Swarovski Elements Cosmic Rings
- 3 20mm Swarovski Elements Triangles

tools

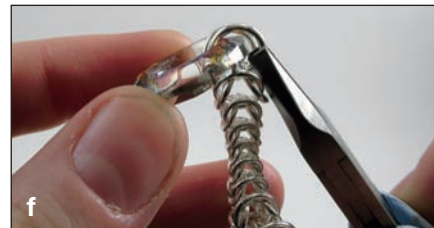
- 2 pairs of chainnose, bentnose, or flatnose pliers

Kits for Vanessa's projects are available at kalibutterfly.com.

Crystal units

[1] Before you begin, refer to the materials list and open all of the A, B, and H jump rings. Open six C rings and open 24 D, F, and G rings. Close the remaining jump rings. Slide an open A ring through one side of a crystal triangle, and close it. Repeat with a second A ring (**a**).

[2] Pick up two closed C rings with an



open C ring, and slide the open ring onto the triangle in between the two A rings. Close the ring. Slide a second open C ring through the triangle and the two closed C rings. Close the ring (**b**).

[3] Let the two hanging C rings fall to either side of the triangle. With your fingers, pinch the hanging rings together and squeeze them up so that the two C rings above them part into a V (**c**). The space between the V is where you add new rings. You have created your first unit of box chain.

[4] Slide an open D ring through two closed D rings and then through the two C rings between the V. Close the D ring. Slide a second open D ring along the same path, and close it (**d**).

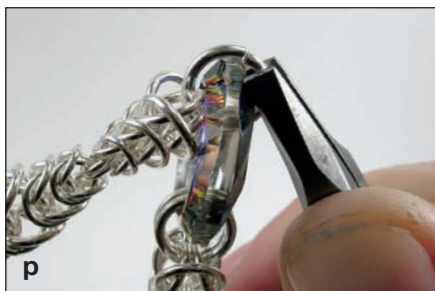
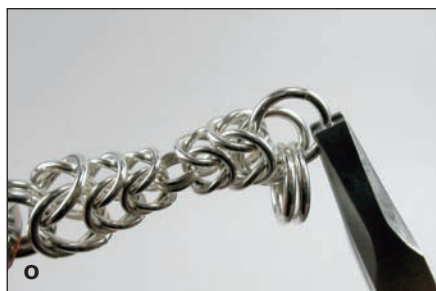
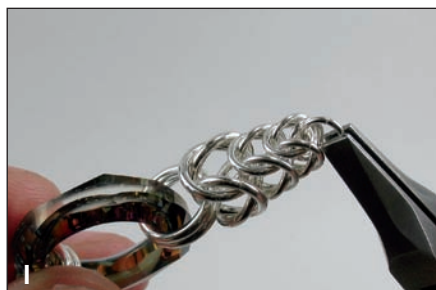
[5] Repeat steps 3 and 4 with the following sets of ring sizes: E, F, G, F, E, D (**e**).

[6] Let the hanging D rings fall to either side of the chain, and push them toward the center. Slide an open B ring through the two D rings between the V and then through a crystal ring. Close the B ring. Slide a second B ring along the same path, and close it (**f**).

[7] Repeat steps 1–6 twice to create a total of three crystal units (**g**).

Connect the crystal units

[8] Slide an open B ring through a crystal ring, and close it. Repeat to add a second B ring to the crystal ring (**h**).



[9] Slide an open D ring through two closed D rings and then through the two B rings. Close the D ring. Slide a second open D ring along the same path, and close it **(j)**.

[10] Let the D rings at the end of the chain fall to either side of the chain. Squeeze them toward the center until the rings part into a V. Pick up two closed E rings with an open E ring, then slide the open ring through the D rings between the V. Close the open ring. Slide a second open E ring along the same path, and close it **(j)**.

[11] Let the E rings at the end of the chain fall to either side of the chain. Squeeze the E rings toward the center until they part into a V. Slide an open F ring through two closed F rings and then through the E rings between the V. Close the open ring. Slide a second open F ring along the same path, and close it **(k)**.

[12] Let the F rings at the end of the chain fall to either side of the chain. Squeeze them toward the center until they part into a V. Slide an open G ring through the F rings between the V, and close it. Repeat to add a second G ring along the same path **(l)**.

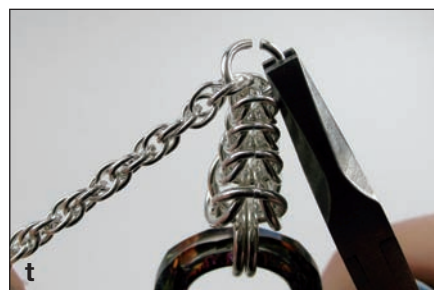
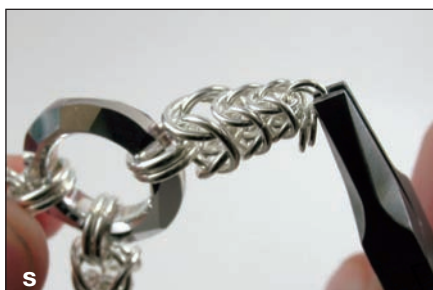
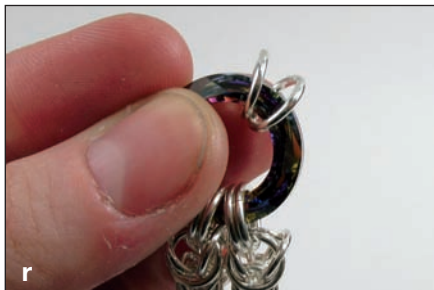
[13] Slide an open F ring through two closed F rings and the two G rings. Close the open ring. Repeat to add a second F ring along the same path **(m)**.

[14] Let the F rings at the end of the chain fall to either side of the chain. Squeeze them toward the center until they part into a V. Slide an open E ring through two closed E rings and then through the F rings between the V. Close the open ring. Repeat to add a second E ring along the same path **(n)**.

[15] Repeat step 14 with D rings **(o)**.

[16] Let the D rings fall to either side of the chain and squeeze them toward the center. Slide an open B ring through the D rings between the V. Slide the crystal ring of the second crystal unit through the open ring, then close the ring. Repeat to add a second B ring along the same path **(p)**.

[17] Repeat steps 8–16 to connect the third crystal unit to the piece **(q)**.



[18] Slide an open B ring through the crystal ring on the left side. Close the ring. Repeat to add a second B ring to the crystal ring **(r)**.

[19] Use the two B rings as the start of another box weave. Add four units of box weave in the following sizes: D, E, F, and G **(s)**.

[20] Slide an open H ring through the G rings between the V and then through the last two links of a 5-in. (12.7cm) rope chain. Close the ring **(t)**.

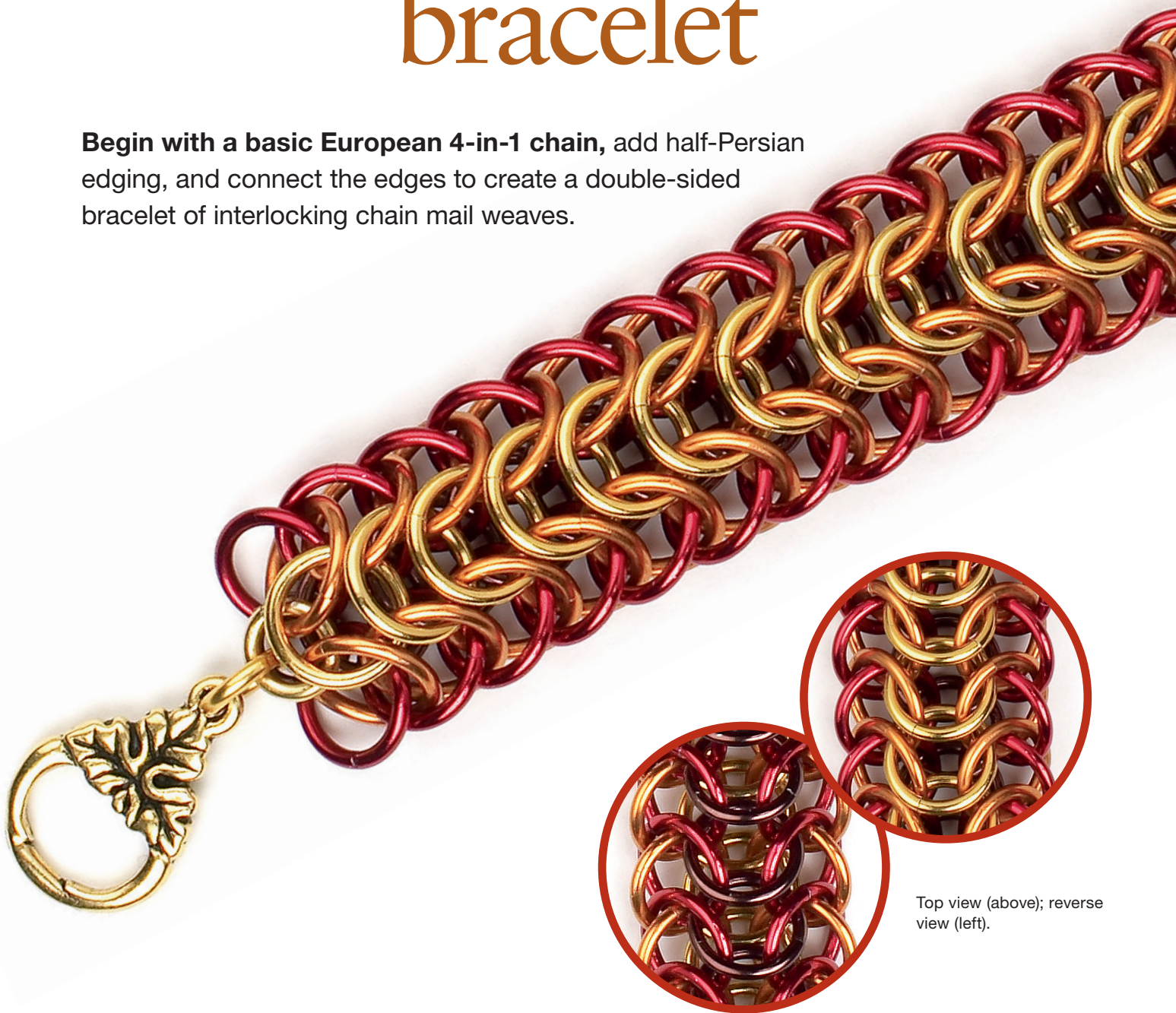
[21] Slide an open H ring through the last two links of the open end of the rope chain, then through a figure-8 clasp. Close the ring **(u)**.

[22] Repeat steps 18–20 to add the box chain weave and a second rope chain to the crystal ring on the right side **(v)**.

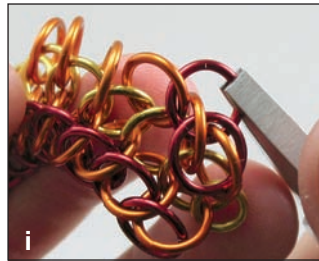
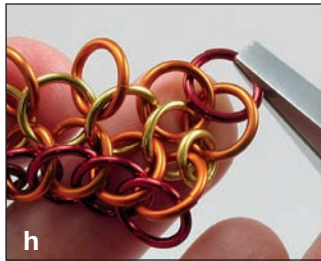
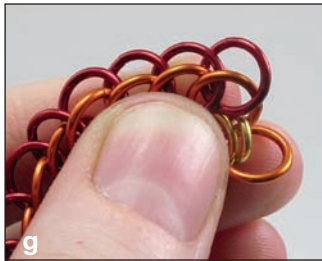
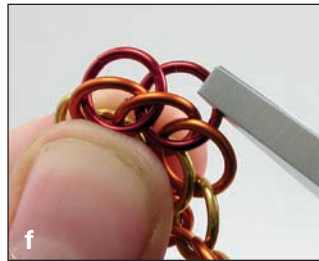
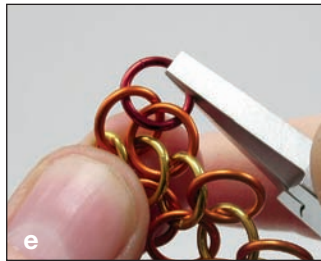
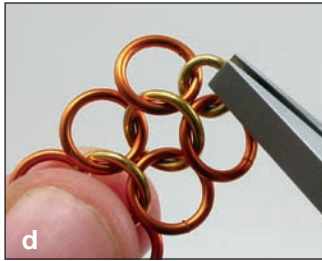
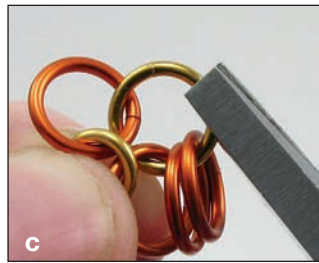
[23] Slide an open H ring through the last two links of the open end of rope chain, then through the closed I ring. Close the H ring **(w)**.

Reversible Chain Reaction bracelet

Begin with a basic European 4-in-1 chain, add half-Persian edging, and connect the edges to create a double-sided bracelet of interlocking chain mail weaves.



Top view (above); reverse view (left).



4-in-1 base

[1] Close all of the color A 6mm jump rings, and open all the remaining jump rings.

[2] Slide a color C 3.9mm ring through two As, and close it **(a)**.

[3] Hold the C added in step 2 so the As flare out above the C **(b)**. Slide a C 6mm ring through two new As, then slide it down through the front of the right-hand A and up through the back of the left-hand A added in step 2, and close it **(c)**.

[4] Repeat step 3 to add the remaining As.

[5] Slide a C 3.9mm down through the front of the last right-hand A and up through the back of the last left-hand A, and close it **(d)**.

Half-Persian edging

[6] At the starting end of the 4-in-1 base, begin working on the right side of the chain. Slide a color B 6mm ring up through the back of the second A and down through the front of the first A, and close it **(e)**.

[7] Slide a B up through the back of the third A and down through the front of the second and first As, and close it **(f)**, making sure you are placing the new B behind the previous B added. Repeat this step to the end of the base.

[8] At the end of the right-hand side, slide a B through the front of the last two As, and close it **(g)**.



[9] Go back to the starting end of the base to work on the left-hand side. Slide a B up through the back of the first A and down through the front of the second A, and close it **(h)**.

materials

warm-tone bracelet

7 in. (18cm)

- 6mm anodized aluminum jump rings, 18-gauge:
 - 62 color A (orange)
 - 62 color B (red)
 - 30 color C (gold)
 - 30 color D (brown)
- 3.9mm ID anodized aluminum jump rings, 18-gauge
 - 4 color C (gold)
 - 2 color D (brown)
- 2 3mm ID anodized aluminum jump rings, 18-gauge, (brass)
- toggle clasp (gold plated)

cool-tone bracelet colors:

- color A (black)
- color B (blue)
- color C (silver)
- color D (gray)

tools

- 2 pairs of chainnose, bentnose, or flatnose pliers

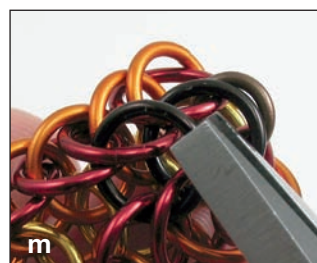
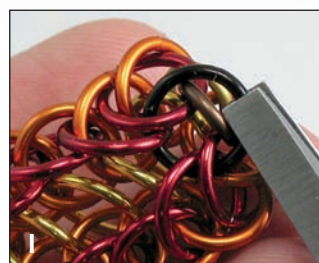
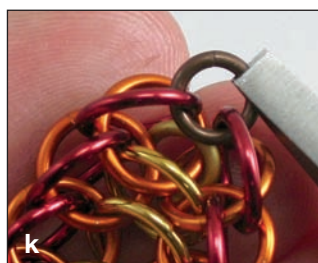
[10] Slide a B up through the back of the first and second As and down through the front of the third A, and close it **(i)**, making sure you're placing the new B behind the previous B. Repeat this step for the length of the base.

[11] At the end of the left-hand side, slide a B through the back of the last two As, and close it **(j)**.

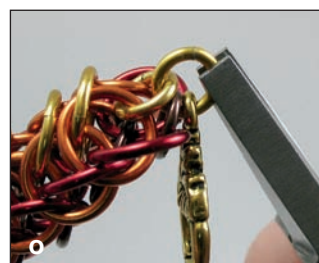
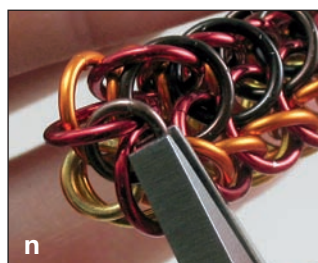


Join the edges

[12] Return to the starting end of the bracelet, and turn it over. Run your finger down the spine of As to make the Bs flip in toward the center (the position they need to be in as you join them). Slide a D 3.9mm ring down through the end B on the right side and up through the end B on the left side, and close it **(k)**.



[13] Slide a D 6mm ring down through the first and second Bs on the right side and up through the second and first Bs on the left side, and close it **(l)**.



[14] Slide a D 6mm down through the second and third Bs on the right side and up through the third and second Bs on the left side, and close it **(m)**. Continue to connect the remaining edge links.

[15] At the end of the bracelet, slide a D 3.9mm down through the last B on the right side and up through the last B on the left side, and close it **(n)**.

Add the toggle clasp

[16] Slide a C 3.9mm through the toggle ring and the D 3.9mm and C 3.9mm on one end, and close it **(o)**.

[17] Slide a C 3.9mm through the D 3.9mm and C 3.9mm on the other end, and close it.

[18] Slide a 3mm jump ring through the C 3.9mm added in step 17, and close it. Slide another 3mm jump ring through this 3mm and the toggle bar, and close it **(p)**.

Technique Tip

It's important to work with the same surface facing up for the 4-in-1 base and half-Persian edging. To make sure you're always working on the right side, mark the first 3.9mm ring with a twist tie: Fold the twist tie in half, guide the fold through the ring, and pull the twist tie ends through the fold to make a lark's head knot with the folded loop on the top surface of the chain. Then, if you drop the chain, you'll be able to figure out which surface is the top.



Laura Poplin

“I love the fabric-like properties of chain mail and the depth it gives finished jewelry.”

Although Laura's background is in corporate sales, she has always dabbled in creative pursuits, such as knitting, sewing, and decorating. After trying several jewelry-making techniques, she found her true passion in a chain mail class. She began experimenting with many of the 1,000+ weaves, and eventually added metalwork, leather, and enameling to the mix. She enjoys the unlimited design possibilities available when techniques are combined.



Akemi earrings

These earrings use a simple 2+2 chain pattern. Antiqued copper and amber-colored beads give them an organic, vintage feel.



materials

- Antiqued copper jump rings:
 - **36** 18-gauge 3.25mm (large)
 - **40** 20-gauge 2.75mm (small)
- 20- or 22-gauge copper sheet, approx. 2x2 in.
- **10** 4–5mm beads
- **10** antiqued copper headpins
- Pair of earring wires or post-back earring findings

tools & supplies

- 2 pairs of chainnose, bentnose, or flatnose pliers
- Jeweler's saw and blades
- Hand file set
- Drill with #67 drill bit
- Center punch
- Texture hammer
- Bench block
- Patina



Metalwork

[1] Follow the template to make two triangle shapes. Apply the texture and patina of your choice.

Chain mail

[2] Using 10 large rings and eight small, make a 2+2 chain (see tutorial, page 62).

[3] Using six large rings and four small, make a second 2+2 chain. Attach the shorter chain to the three middle rings of the longer chain using two small rings for each connection.



template

[4] Attach two additional large rings to the center ring of the bottom triplet using two small rings.

[5] Repeat to make a second Japanese 12-in-2 section for the other earring.

[6] Place the chain below each triangle shape and mark placement of the holes **(a)**. Using a #67 drill bit, drill five evenly spaced holes along the bottom of each triangle and one at the top of each as shown on the template. Use a file to remove any burrs and smooth the edges of the shapes.



Wirework

[7] Make 10 wrapped-loop dangles with the beads and headpins.

[8] Attach each chain mail section to a triangle using the small rings. Attach a bead dangle to each of the five bottom rings using the existing large rings **(b)**. Attach each triangle to an earring wire.

Japanese Variations Tutorial

The Japanese category of chain mail usually consists of layers of jump rings held together by smaller rings, although you can find many complicated variations as well. This tutorial is a basic 12-in-2 pattern; it is the basis for many more-complicated weaves. The flat surface of these weaves makes Japanese-style chain a perfect foil for leather and metal shapes.

This tutorial demonstrates the 12-in-2 weave using 16 18-gauge 3.25mm jump rings (shown in antiqued brass) and 14 20-gauge 2.75mm jump rings (silver). This technique can be adapted to connect any lengths of chain made in A and B.

The most common ring sizes used for sturdy jewelry made with this type of weave are 18-gauge 3.25mm and 20-gauge 2.75mm.

[1] Close all large rings and open all small rings. Pass an open ring through four closed rings and close it. Pass another open ring through the same four closed rings. Arrange the chain in a 2+2+2 pattern **(a)**.

[2] Add to the chain by passing a small ring through two of the previously added large rings and two new large rings. Repeat to add a second small ring through the same four large rings.



Continue until the chain consists of eight pairs of large rings connected to seven pairs of small rings **(b)**.

[3] Fold the chain in half. Pass a small ring through the two large rings on each end and close it. Pass an additional small ring through the same two pairs and close it. Repeat across the row until the chains are connected into a rectangle **(c)**.

Lille bracelet

This design combines three of my favorite unconventional materials. It gives you opportunities to express your style if you'd like to vary the colors of the leather and the texture of the metal.



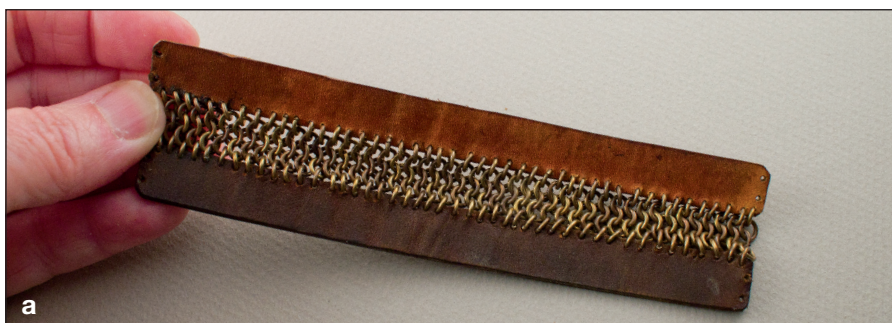
materials

bracelet 7¼ in. (18.4cm)

- Brass jump rings:
 - 130 18-gauge 3.25mm
 - 90 18-gauge 3mm
- 2 5½ in. finished leather strips
- Ball-and-socket clasp
- 2 brass shapes from template

tools & supplies

- 2 pairs of chainnose, bentnose, or flatnose pliers
- Needle tool or pick
- awl
- Jeweler's saw and blades
- Hand file set
- Drill and drill bits
- Center punch
- Texture hammer
- Bench block
- Butane torch
- Solderite pad or charcoal block
- Sandpaper or sanding pads
- Polishing cloth or pads



[1] Anneal half of the brass jump rings to darken them.

Chain mail

[2] Make a 5½-in. (14 cm) single European 4-in-1 chain (tutorial, page 65) and adjust the length if necessary.

Textured sheet metal shapes

[3] Apply texture and patina to the metal shapes, and finish as desired.

[4] Drill six holes along the straight edge of each shape and one for the clasp attachment as shown on the template.

[5] Place the chain between the leather strips and use the awl to mark placement of 45 holes that will connect the chain to each leather piece.

[6] Drill the holes and use 3mm jump rings to connect the chain to the leather.

Connect

[7] Place a metal shape at one end of the bracelet and mark the hole placement on the leather. Repeat for the second end, marking two holes in each end of each leather strip.

[8] Drill the end holes (a).

[9] Use 3mm jump rings to attach the metal shapes to the bracelet; attach two rings to each leather strip and two to the chain (b).

[10] Use 3mm rings to attach half of the clasp at each end.



template

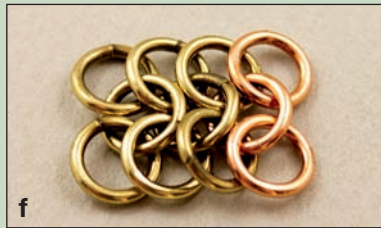
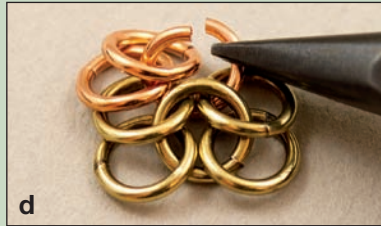
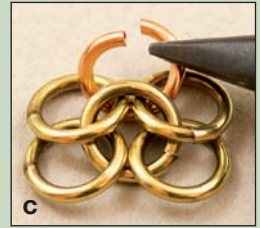
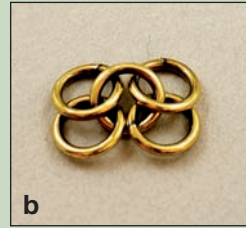
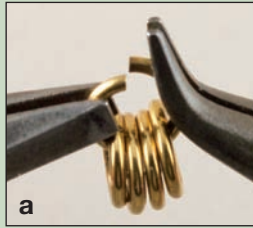
European 4-in-1 Tutorial

Of all the chain mail weaves, European 4-in-1 is the most versatile. When made with small rings, it feels like a wonderful fabric. Using larger rings creates a more organic look.

Close two-thirds of your rings and open the other third.

Pass an open ring through four closed rings and close it **(a)**. Place the unit of five as shown **(b)**. Pass a new open ring through the two top rings **(c)**. Add two closed rings to the open ring and close it **(d)**. Arrange the rings you just added to match the pattern set by the first five rings **(e)**. Repeat the previous step until the chain is the desired length **(f)**.

Build a second chain the same size as the first and lay them side by side **(g)**. Join the two 4-in-1 chains by passing an open ring through the inside, top two rings on each chain **(h)**. Continue by connecting the last connected pair with the next unconnected pair **(i)**. Continue connecting the two chains with single rings until the end **(j)**.



Joie de Vivre pendant

This pendant gives you plenty of opportunities for personalization (hint—it makes a great gift). Incorporate meaningful phrases or add some birthstone crystals or favorite beads.



materials

for the chrysanthemum unit:

- Copper jump rings:
 - 55 21-gauge $\frac{3}{32}$ -in.
 - 1 16-gauge $\frac{3}{32}$ -in.
- Sterling silver rings:
 - 13 21-gauge $\frac{1}{8}$ -in.

for the bail:

- 8 18-gauge 3.25mm brass rings
- Sterling silver jump rings:
 - 8 20-gauge 2.75mm
 - 2 20-gauge 3.75mm
 - 2 18-gauge $\frac{3}{16}$ -in.
 - 5 3.75mm sterling silver jump rings
- 3 pieces of sheet metal (sterling silver, copper, and brass), 20- or 22-gauge, each approx. $1 \times 1\frac{1}{2}$ in. (enough for one leaf shape)
- 14-gauge half-hard sterling silver wire, $4\frac{1}{2}$ in.
- Leather cord necklace, 16–18 in.

tools & supplies

- 2 pairs of chainnose, bentnose, or flatnose pliers
- Jeweler's saw and blades
- Hand file set
- Drill and drill bits
- Center punch
- Chasing hammer
- Texture hammer
- Bench block
- Butane torch
- Paste solder
- Solderite pad or charcoal block
- Sandpaper or sanding pads
- Liver of sulfur
- Polishing cloth or pads
- Alphabet and/or design stamps
- Tumbler (optional)

Practice stamping words on a scrap piece of metal to perfect your stamping technique and ensure the words will fit.

The pendant components



Chain mail

[1] Make one Chrysanthemum unit (tutorial, page 68) with the copper, sterling silver, and brass jump rings. Tumble-polish if desired.

Wire hoop

[2] Make a hoop from the sterling silver wire, and solder it closed. Sand and finish the join until it is smooth.

Bail

[3] Make two 2+2 chains using the 18-gauge 3.25mm brass rings and the 20-gauge 2.75mm silver rings.

[4] Lay one chain above the wire hoop and one inside it.

[5] Use four 20-gauge 3.75mm rings to connect the two chains, enclosing the hoop.

[6] Attach the Chrysanthemum unit to the bottom of the bail with two 21-gauge $\frac{3}{32}$ -in. rings (a).



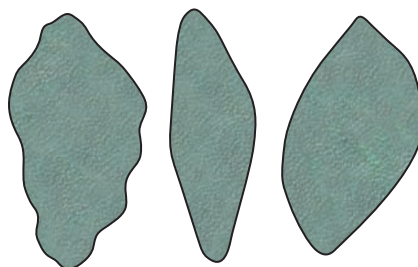
Metal leaf shapes

[7] Trace three leaf templates (below) onto the metal sheet.

[8] Cut out the leaves and finish the edges with files and sandpaper.

[9] Drill a hole at the top of each leaf. Stamp letters, words, phrases, or designs on each leaf.

[10] Apply patina to the leaves. Sand the surfaces to create contrast with the stamped letters. Attach the leaves to the bottom of the hoop with 3.75mm jump rings. Tumble if desired. Attach the bail to the leather cord with the remaining three 3.75mm jump rings.



templates

Chrysanthemum Weave Tutorial

The Chrysanthemum weave is based on the European 4-in-1, which is one of the oldest, most popular weaves. The units can be attached together to make a bracelet, but unless other elements are supporting and protecting this delicate flower, it can be rather fragile. I like to make this weave using a variety of jump ring colors.

The tutorial uses these ring sizes:

55 21-gauge $\frac{3}{32}$ in.

1 16-gauge $\frac{9}{32}$ in.

11 18-gauge $\frac{5}{32}$ in.

13 21-gauge $\frac{1}{8}$ in.

[1] Close 22 21-gauge $\frac{3}{32}$ -in. rings, slide them onto the 16-gauge 5mm ring, and close the 5mm ring **(a)**. Open the remaining 22 $\frac{3}{32}$ -in. rings.

[2] Pass an open $\frac{3}{32}$ -in. ring through the first and second ring, and close it. Pass an open $\frac{3}{32}$ -in. ring through the second and third ring, and close it **(b)**.

[3] Continue working in the same direction around the large ring, making sure each ring you add lies under the previous ring **(c)**.

[4] You should have 11 18-gauge $\frac{5}{32}$ -in. rings, 11 21-gauge $\frac{3}{32}$ -in. rings, and 13 21-gauge $\frac{1}{8}$ -in. rings remaining. Proceed with the next row in the same manner, except alternate 18-gauge rings and 21-gauge $\frac{1}{8}$ -in. rings **(d)**.

[5] Pass an open 21-gauge $\frac{3}{32}$ -in. ring through two 21-gauge $\frac{1}{8}$ -in. rings from the previous row. This takes place in the middle of the 18-gauge rings and causes the flower to become three-dimensional **(e)**.

[6] Continue around to create the finished flower **(f)**.



This weave requires accurate aspect ratio. If you're making jump rings, test a few before you cut an entire batch.

Clichy pendant & earrings

The twisted wire of the Clichy pendant and earrings gives the double hoops extra dimension and provides textural contrast to the shiny Herkimer diamonds and pearls. Create one Clichy component for a pendant or two for earrings—the technique is exactly the same; you'll just change the sizes of the jump rings and beads. If you'd like a petite version of the earrings, try using only one hoop or make the hoops smaller.



materials

pendant

- Sterling silver jump rings:
 - 70 18-gauge 3.5mm
 - 10 18-gauge 3.25mm
 - 4 18-gauge 6mm
 - 8 18-gauge 3mm
- Sterling silver twisted wire, 14-gauge, 8¼ in. cut into a 5¼-in. and a 3-in. piece
- 7 6mm Herkimer diamond beads
- 9 6mm pearls
- 16 antiqued 24-gauge sterling silver headpins
- Leather cord necklace

earrings

- Sterling silver jump rings:
 - 162 20-gauge 2.75mm
 - 20 18-gauge 3mm
- 16-gauge twisted wire, 11 in. cut into two 5-in. and two 3-in. pieces
- 18 4mm Herkimer diamond or smoky quartz beads
- 18 24-gauge silver headpins
- 30 3mm pearls
- Pair of earring wires

tools

- 2 pairs of chainnose, bentnose, or flatnose pliers
- Butane torch
- Paste solder
- Solderite pad or charcoal block
- Sandpaper or sanding pads
- Liver of sulfur
- Polishing cloth or pads
- Bezel or ring mandrel
- Oval bracelet mandrel
- Rawhide mallet

The pendant components



A Herkimer diamond is a somewhat rare quartz crystal with a point at each end. Any clear, faceted gemstone is a good substitute.

The earring components



Hoop sets

[1] Form each piece of twisted wire into a hoop and solder the ends together.

[2] Gently shape the small hoop on a bezel or ring mandrel using a rawhide mallet.

[3] Use an oval bracelet mandrel to shape the larger hoop in the same way (**a**).

[4] Antique the hoops, headpins, jump rings, and earring wires; buff the hoops with a polishing cloth or sandpaper to

accent the design; and tumble-polish if desired.

Chain mail and dangles

[5] Working with 3.5mm jump rings for a pendant or 2.75mm jump rings for earrings, attach 10 rings to the small hoop.

[6] Add two rows as explained in the European 4-in-1 Triangle Tutorial (page 72), attaching a Herkimer diamond bead dangle to each jump ring in the second row before closing it.

[7] Add a ring with a bead on each side.

[8] Add 13 jump rings to the large hoop and complete in the same way as the small hoop.

[9] On the last row, add a wrapped-loop pearl dangle to each ring before closing it. Add a ring with a pearl dangle on each side of the triangle (**b**).

Make two sets of hoop components for earrings.



Chain mail bail

The bail is based on a variation of the Japanese 12-in-2 weave (see tutorial on page 62).

[10] For earrings: Using 18-gauge, 3mm (large) and 20-gauge, 2.75mm (small) rings, make a 2+2+2+2 chain. Connect the end pairs with a pair of small rings to form a triangle **(c, top)**. Make a 2+2+2 chain **(c, bottom)**.

[11] Place the chain triangle above the wire hoop and the straight chain inside it. Use four small rings to connect the two chains, enclosing the hoop **(d)**.

[12] Attach the small hoop to the bottom of the straight chain using four 20-gauge 2.75mm rings **(e)**. Make a second earring.

[13] For a pendant: Using 18-gauge, 3.25mm and 18-gauge, 3mm rings, make two 2+2 chains and connect them to make a square.

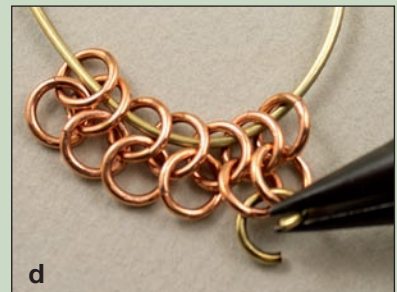
[14] Attach the bottom of the square to the two hoops using four 3.25mm rings. At the top, attach the square to the leather cord using four 6mm rings.

European 4-in-1 Triangle Tutorial

Attach an odd number of closed rings to a scrap wire and twist the wire closed **(a)**. (If your project calls for the triangle to end on a wire shape, you can build it on that wire.)

Pass an open ring through the first two rings and close. Pass an open ring through the third and second ring **(b)** and close. Pass an open ring through the fourth and third ring and close. Add one ring at a time in the same way until you reach the end of the row **(c)**.

Repeat the previous step with each row until the last row has only one ring **(d)**. A finished triangle **(e)**.



Basics & more

- Tools
- Jump rings
- Soldering
- Finishing
- Jewelry-making techniques

Confused about aspect ratio? Wondering how to make your own jump rings? Need a refresher on making a perfect wrapped loop? Not sure about soldering? You'll find everything you need to know in this comprehensive Basics section.

Beyond the basics, Vanessa Walilko and Anne Mitchell provide commentary on chain mail standards and practices, and on using aspect ratio to control the fit of a piece.



Tools

One of the best things about making chain mail jewelry is the relatively few tools it requires. You absolutely must have two pairs of pliers and a pair of wire cutters. The rest of the tools here have to do with specialty techniques or finishing options.

Pliers

When purchasing pliers, inspect the jaws to see that they are smooth and even, look for a solid joint with a little give or wiggle, and try out the handle. When you spend a lot of time with tools in your hand, comfort is important. Here are some of the basic types of pliers and what they do. For chain mail, you'll choose two pairs (either the same type or two different styles) from the first four pliers in the list.

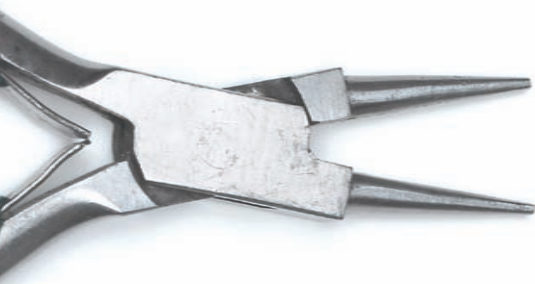
Chainnose pliers have flat inner jaws, great for gripping jump rings and opening and closing loops.

Flatnose pliers can be used in the same manner as chainnose, but their flat outer jaws make it easier to make sharper bends in the wire.

Bentnose pliers are similar to chainnose pliers, but they have a slight bend near the tips. They are often easier to manipulate than straight chainnose pliers are, especially in tight spaces like a chain mail weave.

Nylon-jaw pliers feature replaceable nylon lining on the jaws, which protects wire and jump rings from marks left by tools. These are particularly useful with jump rings that have a thin coating of color that could easily scratch off, such as niobium.

Roundnose pliers are critical for making loops. These pliers have conical jaws.





Cutters

Side cutters are the most common type of cutters. As the name implies, these cutters have blades that are parallel to their handles. Some side cutters have blades that are tilted slightly upward. These are useful because they can cut wire from several angles. Side cutters produce a flush cut on one side and a pinched cut on the other. For jump rings, the pinched side must be cut a second time to make it flush so the jump ring can close properly.

Flush cutters leave less of a bevel, and super-flush or ultra-flush cutters produce a flatter cut and require even less energy to use. However, in exchange for their tremendous cutting ability, super-flush cutters lose strength, so you can use them only for wire finer than 18-gauge.

Jeweler's saws have two parts: an adjustable U-shaped frame with a handle, and a blade. You can use a variety of different blade sizes or thicknesses in the saw; use stronger blades for thicker metal. Use saws to cut shapes from metal and saw through coils to make jump rings.



Dowels and mandrels

Dowels are cylindrical rods, frequently made of wood, that jewelry makers use for shaping wire into jump rings and coils. **Mandrels** are made of steel, plastic, or wood, and have a smooth or stepped taper, so that rings and coils can be easily measured and removed.

Jewelry makers are frequently creative with mandrels and often use other tools, like punches or knitting needles, as mandrels.

Torches

Torches are necessary for annealing and soldering wire components and jump rings. They differ greatly in price range, temperature, and fuel. For our purposes, a simple butane torch is adequate for soldering jump rings.

Files

Metal **files** are used to refine and shape the edges of metal and wire surfaces.



Jump Ring Metals

Gold and silver are the most traditional choices for jump rings, but jump rings are also made from brass, copper, steel, and niobium.

Silver

There are four common silver options: fine silver, sterling silver, Argentium sterling silver, and silver plated. Of these, **fine silver** is the purest, composed almost entirely of silver. Because fine silver is soft, it is not ideal for chain mail.

Sterling silver and Argentium sterling have been alloyed with other metals for additional strength. **Sterling silver** has

long been the material of choice for jewelry makers, since it is strong and malleable. Sterling silver is 92.5% fine silver with 7.5% copper and other metals—thus the .925 stamp on sterling. The drawback to sterling is that its small copper content makes it oxidize at a faster rate than fine silver, so it tends to tarnish quickly.

Argentium sterling is an alloy that substitutes a higher germanium content for the copper to avoid the tarnishing problem while retaining strength. Argentium sterling is considered a great technological advancement in silver, having the best qualities of sterling

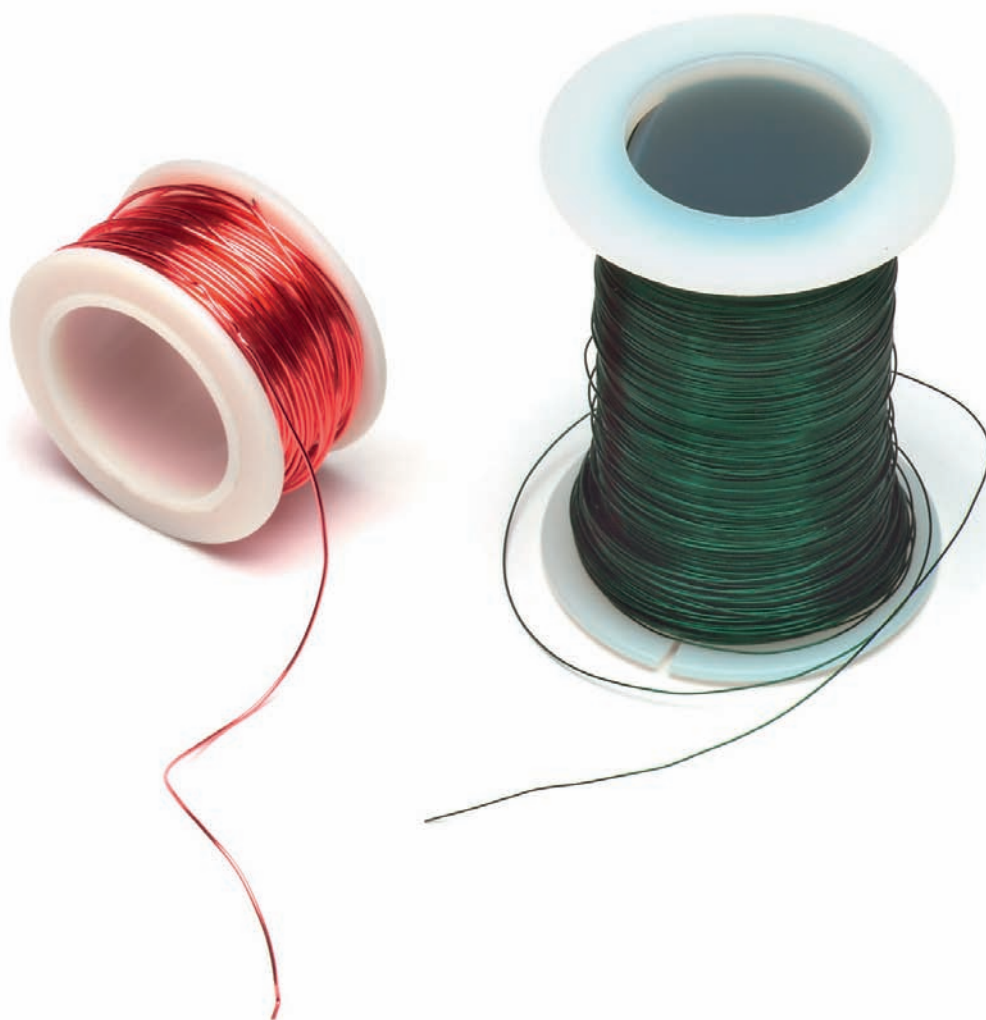
without its oxidation rate. It is a bit stiffer than sterling to work with. Both are excellent materials for jump rings.

Silver-plated wire is frequently found in beading stores and craft shops. This wire is formed by layering sterling silver over a copper or brass core. If the ends are exposed (as on wrapped loops), or the wire is hammered, the core will show. For that reason, many jewelry makers avoid using silver-plated wire.

Gold

Gold wire is sold in different karat weights, tempers, and even colors. Pure, 24k gold is very soft to work with,





while 14k gold is a $\frac{7}{12}$ -gold alloy and is stronger. Gold-filled wire is an economical choice at a fraction of the cost of 14k-gold wire. Contrary to its name, gold-filled wire is actually gold overlay. A thin layer of 14k gold is heat- and pressure-bonded to a brass core. The layer of pure gold makes the wire tarnish-resistant, and it should be cared for just like the expensive version. Buff gold-filled wire with a soft, clean cloth (such as flannel) and store it in a dry place. Placing tissue paper around the gold-filled wire will minimize exposure to humidity and prevent scratching while it's being stored. Both 14k gold and gold-filled are good choices for jump rings and chain mail.

Niobium

Niobium has the same strength as half-hard sterling silver, but it's about 20 percent lighter. One benefit of niobium is that it's hypoallergenic. Many people who can't wear silver or other common jewelry metals wear niobium with no negative effects.

Niobium gets its color from an anodizing process, which coats the surface of the metal with an oxide layer. This is accomplished with an electric charge. The voltage of the charge determines the thickness of the oxide layer, which in turn determines the color. Anodizing is used to prepare many metals for dyeing, because the porous oxide layer allows dye to enter.

The same process turns titanium and niobium a range of colors without the use of dyes.

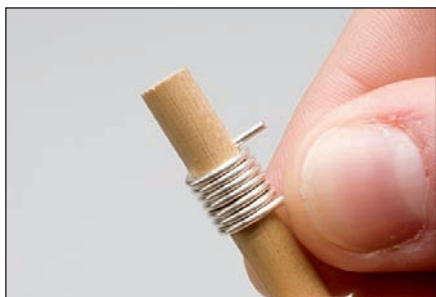
The colored surface of anodized niobium is just that—on the surface. The layer of color is easily scratched, exposing the natural silver color of the niobium. Coating pliers with Tool Magic or painter's tape will help protect niobium jump rings during chain mail assembly.

Making and Using Jump Rings

Coiling jump rings by hand

Select a wooden dowel or mandrel with a diameter that matches the inside diameter of the jump rings you want to make. Drill a hole through one end of the dowel. Insert the end of the wire into the hole, and coil the wire around the dowel.

Cut the wire that anchors the coil. If you will be using wire cutters to cut the coil into jump rings, remove the coil from the dowel. If you will be using a jeweler's saw, slide the coil to the opposite end of the dowel.

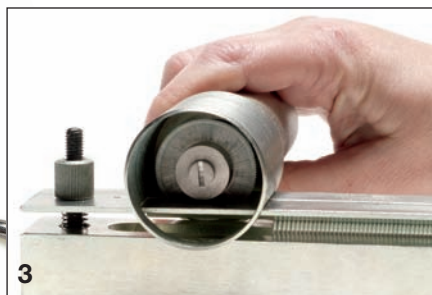


Making jump rings with a jump ring maker

1 If you have a jump ring maker or other tool, follow the manufacturer's instructions to make your coil.

2 Following the manufacturer's instructions, secure the coil in the holding device.

3 Cut the jump rings, following the manufacturer's instructions.

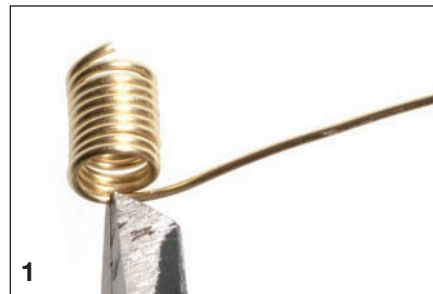


Cutting jump rings using wire cutters

1 Holding the flush-cut edge of your cutters at a right angle to the coil, trim the straight wire tail from each end of the coil.

2 Slightly separate the first ring from the coil. Holding the flush-cut edge of your cutters at a right angle to the coil, cut where the wire completes the first ring.

If you use diagonal wire cutters, one end of your ring will be flush and the other end will be pointed. To flush-cut the pointed end, flip your cutters over to the flush-cut side, and cut again so that both cuts are flush. Then, flush-cut the end of the coil to start the next ring. There will be some wire waste, so make a few extra coils to make up for it.



Cutting jump rings using a jeweler's saw

Secure the dowel against the V notch in your bench pin, and use a jeweler's saw with a 2/0 blade to cut a shallow, vertical slot at the end of the dowel to guide your blade as you cut the coil.

Hold the coil and dowel with your nondominant hand. Saw through the top of the coil, feeding it toward the slot in the dowel. Be careful not to cut the jump rings in half.



Opening and closing a jump ring

1 Hold the jump ring with two pairs of pliers, such as chainnose, flatnose, or bentnose. To open the jump ring, bring one pair of pliers toward you, and push the other pair away from you. Do not pull the jump ring open sideways.

2 To close the jump ring, reverse the direction of the pliers to bring the ends of the jump ring back together. Because jump rings (especially those used in chain mail) tend to spring back, you may find it helpful to bring the tips of the ring a bit past the closed position and then bring them back together.



Jump ring sizes

The inside diameter (ID) of a jump ring is measured by the size of the mandrel used to make it. Some jump ring manufacturers use mandrels that are measured in fractional inches (such as 1/8 in.), while others use mandrels measured in millimeters, which come in quarter-millimeter increments. Likewise, some of the artists in this book have listed their materials in inches, and others specify millimeters. When you are shopping for jump rings to make a project, this can be confusing. For instance, if the project you're working on calls for 15/64-in. jump rings and the vendor you're buying from sells them in fractional inches, you're good to go. But what if the ones you're purchasing are measured in millimeters?

This chart will help you convert from one measurement to the other.

Ring Size in Fractional Inches	Ring Size in Millimeters
3/32 in.	2.5mm
1/8 in.	3.25mm
9/64 in.	3.5mm
5/32 in.	4.0mm
3/16 in.	4.75mm
7/32 in.	5.5mm
15/64 in.	6.0mm
11/32 in.	8.75mm
3/8 in.	9.5mm
1/2 in.	13.0mm



Soldering

Solder is a metal alloy that is used to join two pieces of metal. You can buy solder as wire, paste, or sheet. Solder is available in different grades, ranging from extra hard to extra easy. The harder the solder, the slower it melts. For that reason, if there is more than one solder join in a piece, solder the first one using hard solder, the second using medium solder, and the third using easy solder.

Flux is available as a liquid powder or paste, and is used to coat a surface before solder is applied. Flux helps prevent oxides from forming on the metal when it is heated, which helps solder flow properly.

A *torch* is used to heat the solder and the pieces you wish to join.

Always use a fire-resistant surface, like a *fire brick* or *charcoal block*, and work in a well-ventilated area.

Water is used for quenching and rinsing the pieces. Fill two heat-resistant bowls: one to quench the piece after soldering, and the other to rinse off the pickle.

A *solder pick* is an awl-like tool with a metal tip and an insulated handle (such as wood) used to move and pick up solder. Solder doesn't stick to the metals used in solder picks, like steel, titanium, and tungsten carbide.

Pickle cleans metal and dissolves the flux after the piece is fired. It is slightly acidic, so use it in a well-ventilated area, and take care to keep it off clothes, skin, and other surfaces.

Use *copper tongs* with pickle, as stainless steel will cause a copper plating of other metals in the pickle.

A *warming pot* can be used to keep pickle at a warmer temperature, which makes it work more quickly.

Prepare the join

All metal surfaces must be clean in order for solder to flow. Clean metal by sanding it with 400-grit sandpaper and rinsing it. The surfaces must be in complete contact with each other in order for the solder to join them—solder will not fill holes or gaps.

Flux and heat

Flux the area to be soldered to prevent oxidation. You can apply flux with a dropper or paint it on with a brush (a). Place the solder on the join and heat the entire piece, not just the solder (b). Keep the torch moving in a circular motion. Solder will flow toward the source of the heat, so once the solder begins to flow you can use your torch to direct it where you want it to go. When the solder flows, you'll see a flash of silver and it will move into the join. When this happens, immediately remove the heat.

Pickle and rinse

Once the solder flows, quench the piece in water, and place it in a pickle solution to remove oxidation and flux residue until it is clean and white (for silver). Rinse the piece in clean water.

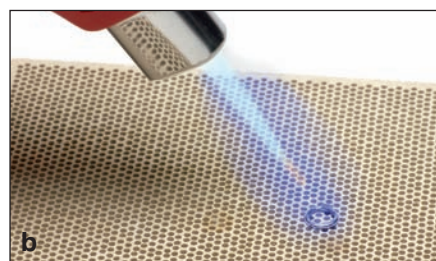
Annealing

The temper of wire is its hardness, or malleability. Silver and gold wires can be purchased at different levels of hardness, such as dead-soft, half-hard, or full-hard. When working with metal, you want it to be pliable enough to manipulate, yet strong enough to hold its shape. Working with wire strengthens it; this is called work-hardening. Additional strength



comes with hammering after you've formed your shape. The trick is to use wire that is soft enough to work with but becomes hard enough to hold the final shape. You likely will want to work with half-hard wire the majority of the time. When connecting elements with double-wrapped loops, the act of wrapping the loops is enough manipulation to fully work-harden the wire so it is at its maximum strength. If you used full-hard wire, it could be too difficult to manipulate. If you use dead-soft wire, it could only become half-hard after wrapping, so it would not maintain its shape as well.

Annealing is the process of heating work-hardened metal until it softens enough to be malleable. Put your metal on a fire-resistant surface, and heat the metal with a torch until it glows a subtle pink. Immediately remove the heat when you see the color, or you'll burn or melt the metal. Dim or turn off the lights to help you see this color change. To finish, quench the metal in water and put it in warm pickle to remove any oxides.



Standards and Practices in Chain Mail—Vanessa Walilko

Jewelry makers are eager for information, tips, and patterns that will help them create successful chain mail pieces. My hope is that this review of standards for chain mail will help you make beautiful jewelry.

Finding closure

Getting a good closure on your rings is one of the most important aspects of successful chain mail jewelry and one of the hardest to master. A good closure shows that you care about making sure that every ring is securely attached to the piece. A hair's breadth of a gap in your ring might not seem like a big deal. But if all of your rings have that much of an opening, chances are that the openings will at some point line up and the rings will come apart.

If you're not sure how your closures measure up, hold the ring up to the light. If light shines through the gap, you'll need to adjust to line up the ends of the wire perfectly. No light means

you're on the way to making your closure just right. **Photo a** shows a good closure. The ends of the wire are lined up and totally flush.

Troubleshooting

Most inadequate closures fall into one of three camps, but thankfully there's an easy way to fix each one once identified.

The most common problem is when the gap in the ring is clearly visible (**b**). To get a better closure, press the ends of the ring inward as you twist it closed.

Photo c shows an overbite—one end of the ring is higher than the other. This means that you're twisting the ring with unequal pressure. Loosen up your grip on your pliers, and be mindful of pressing in the ends of the ring with equal force.

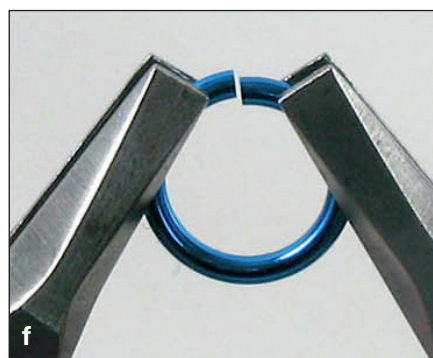
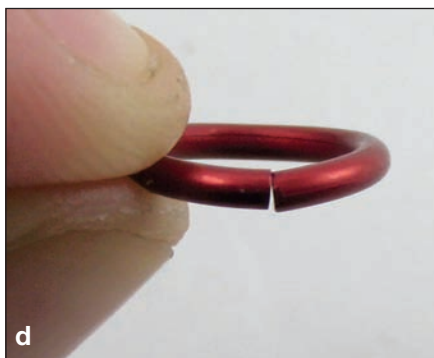
A more subtle problem occurs when the edges of the ring curve instead of lying flat (**d**). To fix this problem, make sure your pliers aren't angled while twisting them back and forth.

Aside from looking more professional, perfect closures ensure that your jewelry pieces are comfortable. If you're an aspiring jewelry designer, you don't want to be known as the artist who makes pieces that scratch!

Get a grip

A good grip on your jump rings reduces the chances of marring them. The plier edges can dig into the rings as you twist them open, leaving visible nicks in the surface (**e**). The result is a piece that looks like it's been poorly cared for before it's even been worn. The effects are more visible on a larger ring since you need more force to twist it open.

Plier position is also important in getting a good grip. You want to cover a good portion of the ring with your pliers to get the torque necessary for effective twisting. With the tips of the pliers angled toward the opening, grip the ring at what would be the 10 o'clock and 2 o'clock positions of a clock face (**f**).





Reversible Chain Reaction
bracelet by Vanessa Walilko

One of the best ways to get a good grip is to coat the jaws of your pliers. Tool Magic is the most effective coating, though tape can also work wonders. I usually wrap a 3-in. (7.6cm) length of masking tape tightly around the tips of my pliers, cutting off any extra tape with scissors. In either case, understand that the coatings are temporary and will have to be replaced when they get too worn to provide adequate grip.

Gauging your rings

As you work on chain mail projects, it's important to know that there are two wire gauge systems: the American Wire Gauge (AWG) and the Standard Wire Gauge (SWG) (see table, p. 85). In the United States, the American Wire Gauge (AWG) scale, also known as the Brown & Sharpe (B&S) gauge, is most commonly used to measure precious metals and the Standard Wire Gauge system is generally used for base metals, though it's not a hard-and-fast rule. Why does this matter? If a pattern was designed with rings in AWG, you might not be able to complete the

weave if you use SWG rings. If you're ever in doubt, ask the supplier about the diameter of the wire to make sure you'll be able to use the rings for your intended project.

Aspect ratio

Aspect ratio is a numerical description of the diameter of the wire used to make the ring compared to the inner diameter of the ring. It's important to understand if you're trying to make a specific weave but want to use a different size ring than what the instructions call for. If your rings are larger and/or made of thinner wire, the weave may not hold its shape. On the other hand, if the rings are smaller and/or made of thicker wire, you may not be able to fit the rings together at all in the intended pattern. While many jump rings are sold with the inner diameter listed in millimeters, the diameter of the wire gauge usually isn't specified. Refer to the AWG/SWG chart to help you get started on figuring out aspect ratio. For more about aspect ratio see page 83.

Know your weaves

There are several families of chain mail weaves, such as European, Persian, and Japanese. If you're not familiar with the characteristics of the weave families, visit maileartisans.org, the website of the Maille Artisans International League. With well over 1,000 weaves and variations catalogued, the site offers lots of information and inspiration.

Control the Fit of Your Chain Mail Weave—Anne Mitchell

Aspect ratio (AR) sounds intimidating because, let's face it, it's math. But conquer this one simple formula, and you'll have complete control over the density of your chain mail work. Do you want an open and airy version of a Byzantine link, or do you like the look of a tightly woven chain? The following information will guide you on the correct choice of jump rings.

The basic formula

Essentially, calculating aspect ratio means figuring out how many jump rings each jump ring can comfortably hold. The math is based on the relationship between the ring's inside diameter (ID) and the thickness of the wire that makes the ring.

Why use a jump ring's ID in the formula instead of its outside diameter (OD)? Because, as seen below, a 5.5mm ID jump ring will have the same ID whether it's made of 16- or 20-gauge wire, but its OD will be different.



So, here's the formula to find AR:

$$\text{ID} \div \text{gauge} = \text{AR}$$

Basic math: If ID and gauge are equal, the ratio is 1, which means that one jump ring threaded through a second would completely fill the second jump ring. The greater the AR, the more space there is for additional rings, so the weave is looser.

Notes about ID and gauge

If you're buying premade jump rings, the supplier will tell you the ID and gauge of your jump rings.

The ID is usually given in millimeters. But there's a caveat, called "springback." Most manufacturers base ID on the size of the mandrel that the wire was coiled around when the jump rings were made. But when that coil is cut into jump rings, the rings tend to "spring back" slightly, so the actual ID of the rings is slightly larger than the mandrel's diameter.

The degree of springback varies with the hardness of the wire. The most reliable way to calculate your ID: Use digital calipers to measure the ID of 10–15 rings from your stash and find the average.

Convert before you calculate

Before you can plug numbers into the AR formula, convert the ID and gauge to the same measuring system. I convert both into inches, but metric works just as well. The key conversion equivalent is:

$$1\text{mm} = 0.0394\text{ in.}$$

To find the inch measurement for your wire gauge, measure the wire with digital calipers or consult a handy chart (page 82).

For example

To find the AR of a 5mm ID, 16-gauge jump ring, first convert to inches:

$$5\text{mm ID} = (5 \times .0394) = 0.197\text{ in.}$$

$$16\text{-gauge wire} = 0.051\text{ in.}$$

Plug these numbers into the basic formula: $\text{ID} \div \text{gauge} = \text{AR}$:

$$0.197 \div 0.051 = 3.86$$

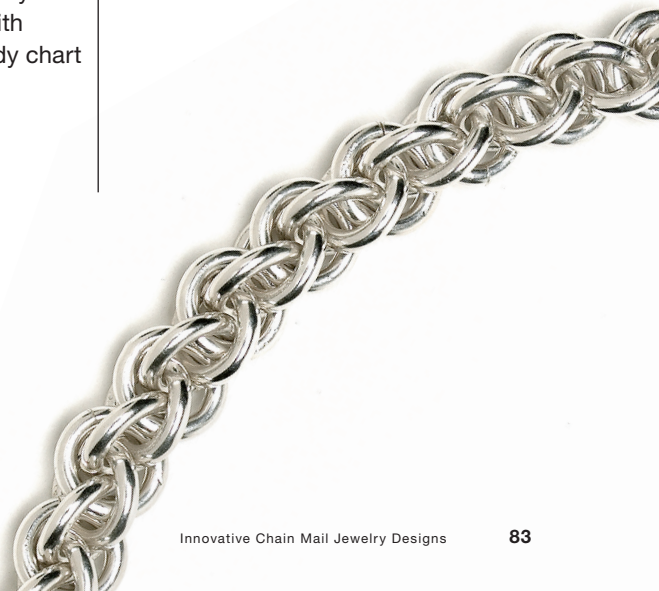
The AR of a 5mm ID, 16-gauge jump ring is 3.86.

AR and chain mail patterns

Many chain mail patterns require a basic understanding of AR. One of the most well known is the Jens Pind. When making a Jens Pind chain I use 6mm ID, 12-gauge jump rings. So:

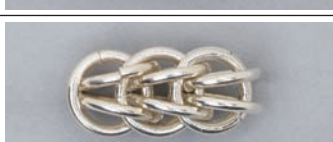
$$0.236 \div 0.081 = 2.91\text{ AR}$$

This is a tight AR. Each link has to hold three rings snugly with a minimum of movement. If the rings are too loose, the pattern won't hold. If the rings are too small, the pattern will be too stiff, if it works at all.



What Difference Does It Make?

The following chain samples with different ARs show how ID and gauge can help you determine which jump rings to use.

Byzantine Link				
Inside diameter	÷ Gauge	= AR	Result	Sample
4mm (0.157 in.)	18 (0.040 in.)	3.93	Slightly open; holds pattern well	
	16 (0.051 in.)	3.08	Too tight; no movement	
5mm (0.197 in.)	16 (0.051 in.)	3.86	Slightly open; holds pattern well	
5.5mm (0.217 in.)	17 (0.045 in.)	4.82	Very open; will not hold pattern	
	16 (0.051 in.)	4.25	Very open; holds pattern	
Full Persian (Foxtail) Link				
5.5mm (0.217 in.)	18 (0.040 in.)	5.43	Tight weave; holds pattern well	
	17 (0.045 in.)	4.82	More open, but still holds pattern	
6.5mm (0.256 in.)	18 (0.040 in.)	6.40	Even more open and holding pattern	
7.5mm (0.296 in.)	16 (0.051 in.)	5.80	Tight weave; holds pattern well	
10mm (0.394 in.)		7.73	Too open to hold pattern	

Gauge	AWG Measurements		SWG Measurements	
24	0.02 in.	0.508mm	0.022 in.	0.558mm
22	0.025 in.	0.635mm	0.028 in.	0.711mm
21	0.029 in.	0.736mm	0.032 in.	0.812mm
20	0.032 in.	0.812mm	0.036 in.	0.914mm
19	0.036 in.	0.914mm	0.04 in.	1.016mm
18	0.04 in.	1.016mm	0.048 in.	1.219mm
17	0.045 in.	1.143mm	0.056 in.	1.422mm
16	0.051 in.	1.295mm	0.064 in.	1.625mm
14	0.064 in.	1.625mm	0.08 in.	2.03mm
12	0.08 in.	2.032mm	0.104 in.	2.641mm

Resizing Rings

Let's say you've found a density that you like for a pattern, like my 2.91 AR for the Jens Pind. What if I want to make the chain using 18-gauge instead of 12-gauge jump rings? To find the jump ring size needed, just multiply rather than divide.

$$\text{AR} \times \text{gauge} = \text{ID}$$

Multiply AR (2.91) by the thickness of the 18-gauge wire (0.040 in.) and get 0.116 in., or roughly 3mm ID jump rings. (For an fractional inch/metric jump ring conversion chart, see page 79.)



Beyond Chain
by Anne Mitchell

Finishing

Tumble-polishing

Place stainless steel shot into the tumbler's barrel. Although you can use any shape of steel shot, a combination of shapes works best; the various shapes polish crevices and contours differently, ensuring an even polish.

Pour in enough water to cover the shot, and add a few drops of burnishing compound. Place your jewelry in the tumbler, and seal the barrel. Turn on the tumbler, and let it run for two hours or more. Pour the contents of the tumbler into a sieve over a sink, and rinse. Remove your jewelry, and dry it. Dry the shot before storing it.

Adding patina (darkening metal) with liver of sulfur

Polish your piece before adding patina. (If you tumble-polish your piece after patinating, reserve the used shot for future patinated pieces; the liver of

sulfur residue will contaminate non-patinated pieces.) Oil and dirt on the piece can affect the patina, so clean the metal with degreasing soap first.

Prepare a liver of sulfur solution according to the manufacturer's instructions. Dip the metal in the solution for a few seconds, and then rinse the metal in cool water to stop the chemical reaction.

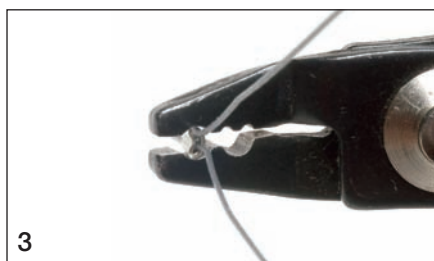
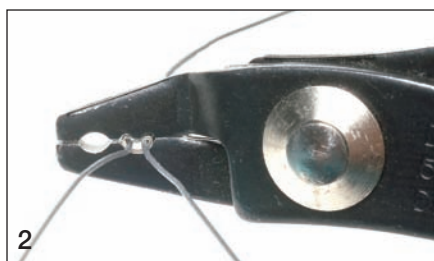
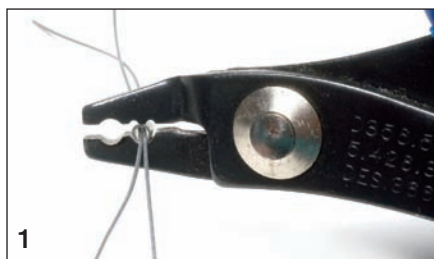
For a darker patina, continue to dip and rinse the metal. Use a brass brush with soapy water to remove or modify the patina. By using different temperatures and amounts of water to make the solution, you can achieve different colors of patina; experiment to find the result you prefer.



Jewelry-Making Techniques

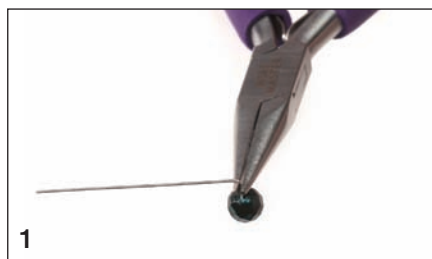
Folded crimp

- 1 Position the crimp bead in the notch closest to the crimping pliers' handle.
- 2 Separate the wires and firmly squeeze the crimp.
- 3 Move the crimp into the notch at the pliers' tip and hold the crimp as shown. Squeeze the crimp bead, folding it in half at the indentation. Test that the folded crimp is secure.

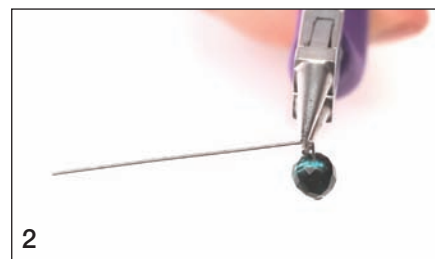


Wrapped loop

- 1 Make sure you have at least 1¼ in. (3.2cm) of wire above the bead. With the tip of your chainnose pliers, grasp the wire directly above the bead. Bend the wire (above the pliers) into a right angle.
- 2 Using roundnose pliers, position the jaws in the bend.
- 3 Bring the wire over the top jaw of the roundnose pliers.



- 4 Reposition the pliers' lower jaw snugly into the loop. Curve the wire downward around the bottom of the roundnose pliers. This is the first half of a wrapped loop.
- 5 Position the chainnose pliers' jaws across the loop.
- 6 Wrap the wire around the wire stem, covering the stem between the loop and the top bead. Trim the excess wire and press the cut end close to the wraps with chainnose pliers.

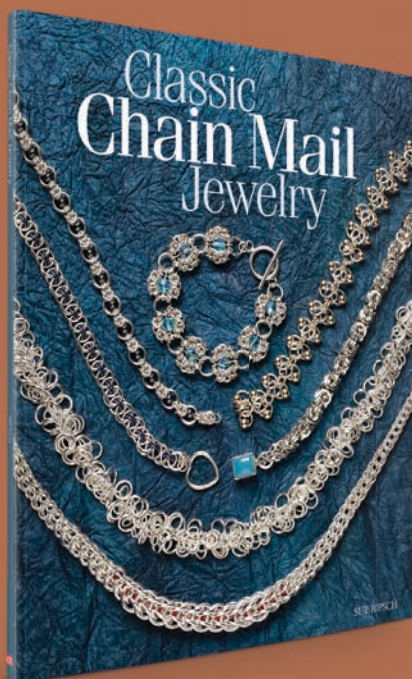


FROM CLASSIC TO CONTEMPORARY

DISCOVER MORE

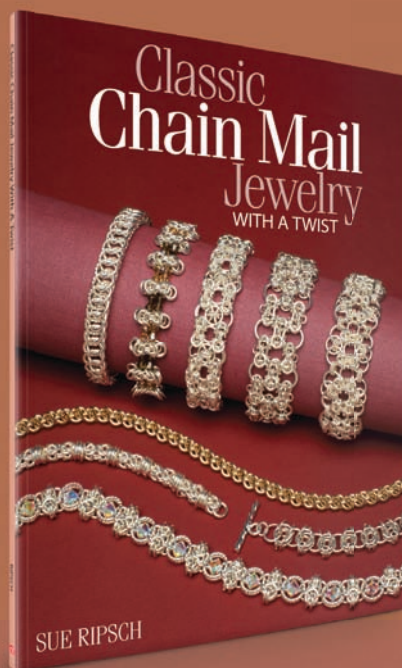
CHAIN MAIL PROJECTS!

If you liked the designs in *Linked*, find more by Sue Ripsch and Laura Poplin in these other books!



In *Classic Chain Mail Jewelry*, Sue Ripsch teaches the basic weaves and shows you how to enhance them with unusual jump rings, beads, and crystals.

64070 • \$21.95



Conveniently arranged by skill level, Sue Ripsch's *Classic Chain Mail Jewelry with a Twist* offers 28 projects to teach you how to break up links, turn them 90 degrees, use multiple weaves in the same piece, and more!

64834 • \$21.95



With *Unconventional Chain Mail Jewelry*, Laura Poplin offers 24 clever projects that help you reimagine traditional chain mail — from earthy bracelets to delicate earrings.

64339 • \$21.95



Buy Now From Your Favorite Bead Or Craft Shop!

Or at www.KalmbachStore.com or 1-800-533-6644

Monday – Friday, 8:30 a.m. – 4:30 p.m. CST. Outside the United States and Canada call 262-796-8776, ext. 661.



www.facebook.com/KalmbachJewelryBooks



www.pinterest.com/kalmbachjewelry

2XBB